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George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama
35812

Reply to A-1 of: ED24-81-31

JUN 5 1966



TO: Distribution
FROM: ED24/Mr. Nesman
SUBJECT: STS-1 Pogo Analysis

REF: (a) Gardner, T. G., "Evaluation of SSME Fluid Dynamic Frequency Response Characteristics," Wyle Laboratories, Research Staff Technical Memorandum MT-80-8, Contract NAS8-33508
(b) Bendat, J. S., and Piersol, A. G., "Measurement and Analysis of Random Data," John Wiley and Sons, Inc., New York, 1966

The purpose of this memorandum is to document some of the pogo related data from STS-1. Brief descriptions of the measurements and data reduction are provided. In the analysis of the data, reference is made to FRF and single engine test results.

The measurements of interest are classified under major project elements of the SSME's, the external tank, and the orbiter. The subsystems involved are structural dynamics and main propulsion. These are all development flight instrumentation measurements.

Data were recorded on-board the orbiter with a minimum response rate of 1.5 to 50 Hz. The wide band, 14 track recorder was used, and the data required demultiplexing before reduction. The flight phase of interest was from liftoff through main engine cutoff.

Data reduction was accomplished using the pogo analysis software for the HP5451C Fourier Analyzer, reference a. Data were filtered 1 to 50 Hz using Precision filters. PSD's were obtained by averaging and using a 0.5 Hz bandwidth. Tabulated RMS values were obtained from PSD's using the equation, reference b,

$$\psi_x = \sqrt{BG_x}$$

where ψ \equiv root mean square value (A)
B \equiv bandwidth (Hz)
 G_x \equiv power spectral density (A^2/Hz)

(NASA-TM-67433) STS-1 POGC ANALYSIS (NASA)
115 p HC A06/MF A01 CSCL 21H

N85-20067

Unclas
63/20 14399

The STS-1 pogo analysis results are attached. These results were presented at the Pogo Panel meeting held on May 21 and 22, 1981.

Tomas E. Nesman

Tomas E. Nesman

APPROVAL:

Robert S. Ryan

Robert S. Ryan
Chief, Structural
Dynamics Division

Enclosure

cc:

EP23/Mr. Gross
EP43/Mr. Hyde
ED14/Mr. Harbison
ED21/Mr. Jewell
ED21/Dr. Schutzenhofer
ED24/Mr. Jones

ORGANIZATION: SYSTEMS DYNAMICS LABORATORY	MARSHALL SPACE FLIGHT CENTER	NAME: R. JEWELL DATE: MAY 1981
<p>STS-1 POGO ANALYSIS</p>		

ORGANIZATION: SYSTEMS DYNAMICS LABORATORY	MARSHALL SPACE FLIGHT CENTER STS-1 POGO ANALYSIS	NAME: R. JEWELL DATE: MAY 1981
<div data-bbox="390 946 432 1101" data-label="Section-Header"> <p style="text-align: center;"><u>CONTENTS</u></p> </div> <div data-bbox="471 474 1307 1553" data-label="List-Group"> <ul style="list-style-type: none"> 0 STS-1 ENGINE/FLIGHT PROFILE CHARACTERISTICS 0 DATA QUALITY ASSESSMENT (29 MEASUREMENTS) 0 DATA ANALYSIS TIME INTERVALS 0 SELECTED PSD ANALYSIS (PRESSURE) 0 COMPARISON OF STS-1 PRESSURE DATA WITH FRF AND SINGLE ENGINE DATA 0 SELECTED PSD ANALYSIS (ACCELEROMETERS) 0 SELECTED TRANSFER FUNCTION ANALYSIS 0 OBSERVATIONS 0 CONCLUSIONS </div>		

ORGANIZATION:

SYSTEMS DYNAMICS
LABORATORY

MARSHALL SPACE FLIGHT CENTER

STS-1 POGO ANALYSIS

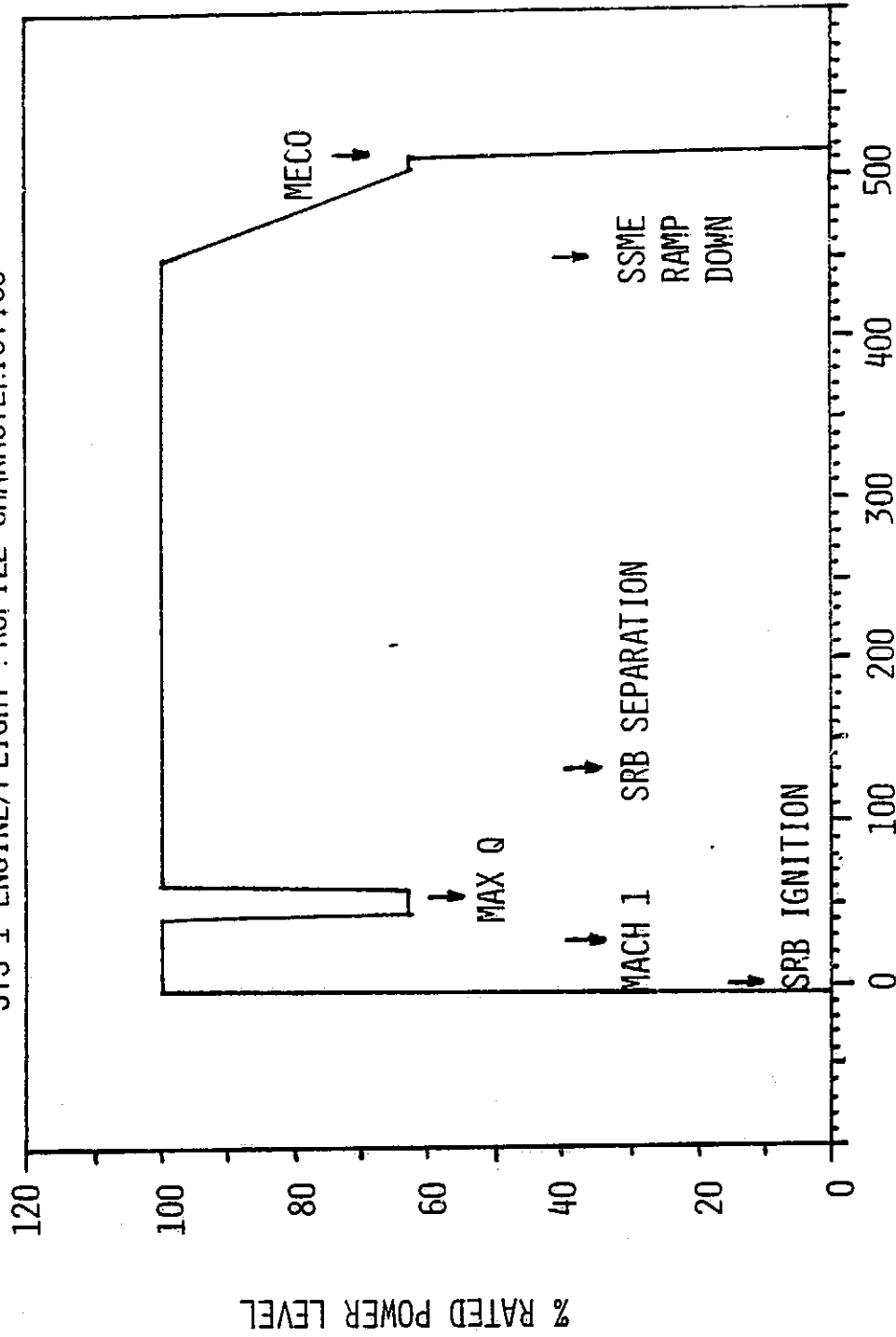
NAME:

R. JEWELL

DATE:

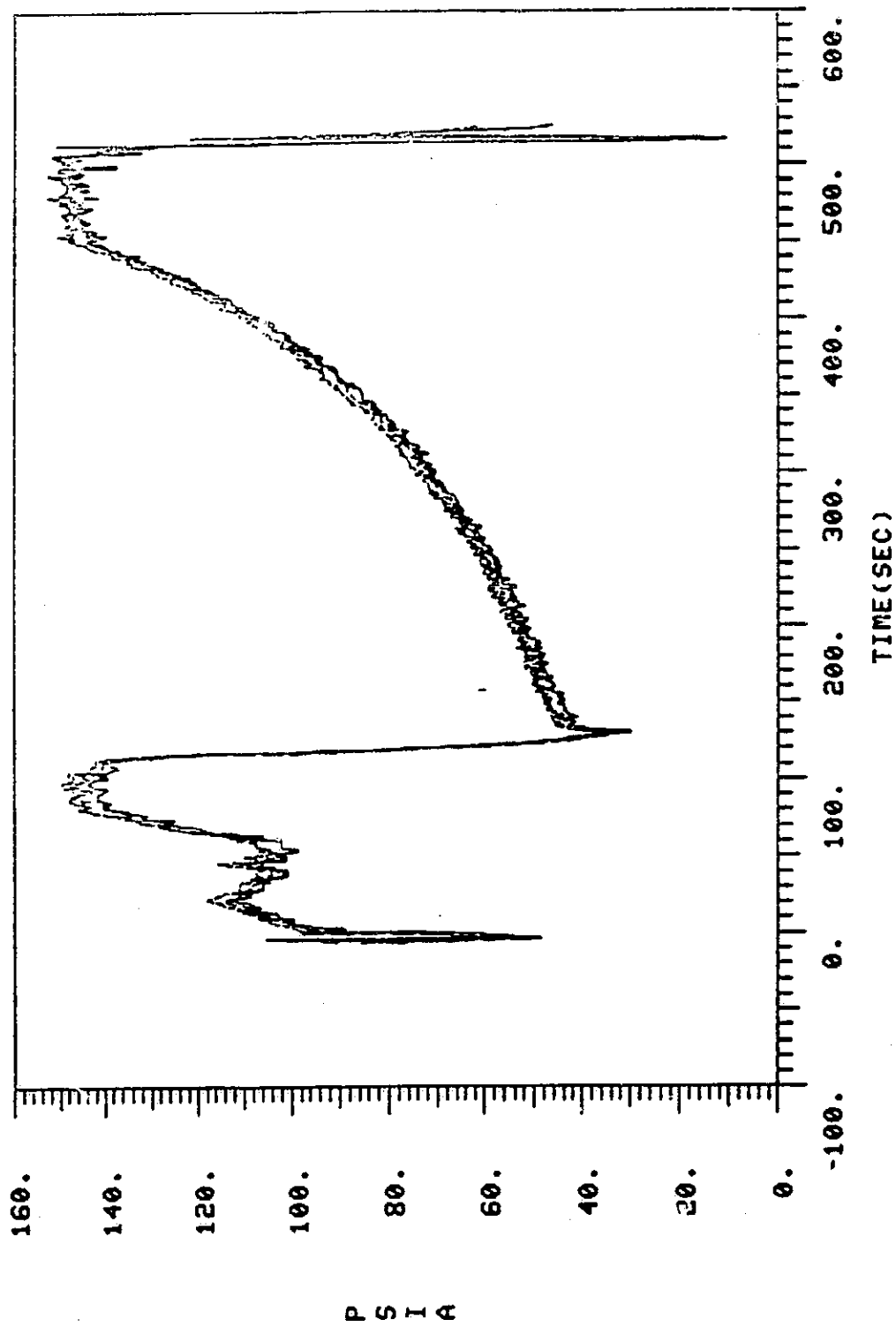
MAY 1981

STS-1 ENGINE/FLIGHT PROFILE CHARACTERISTICS



SECONDS RELATIVE TO 1981:102:12:00:03.000

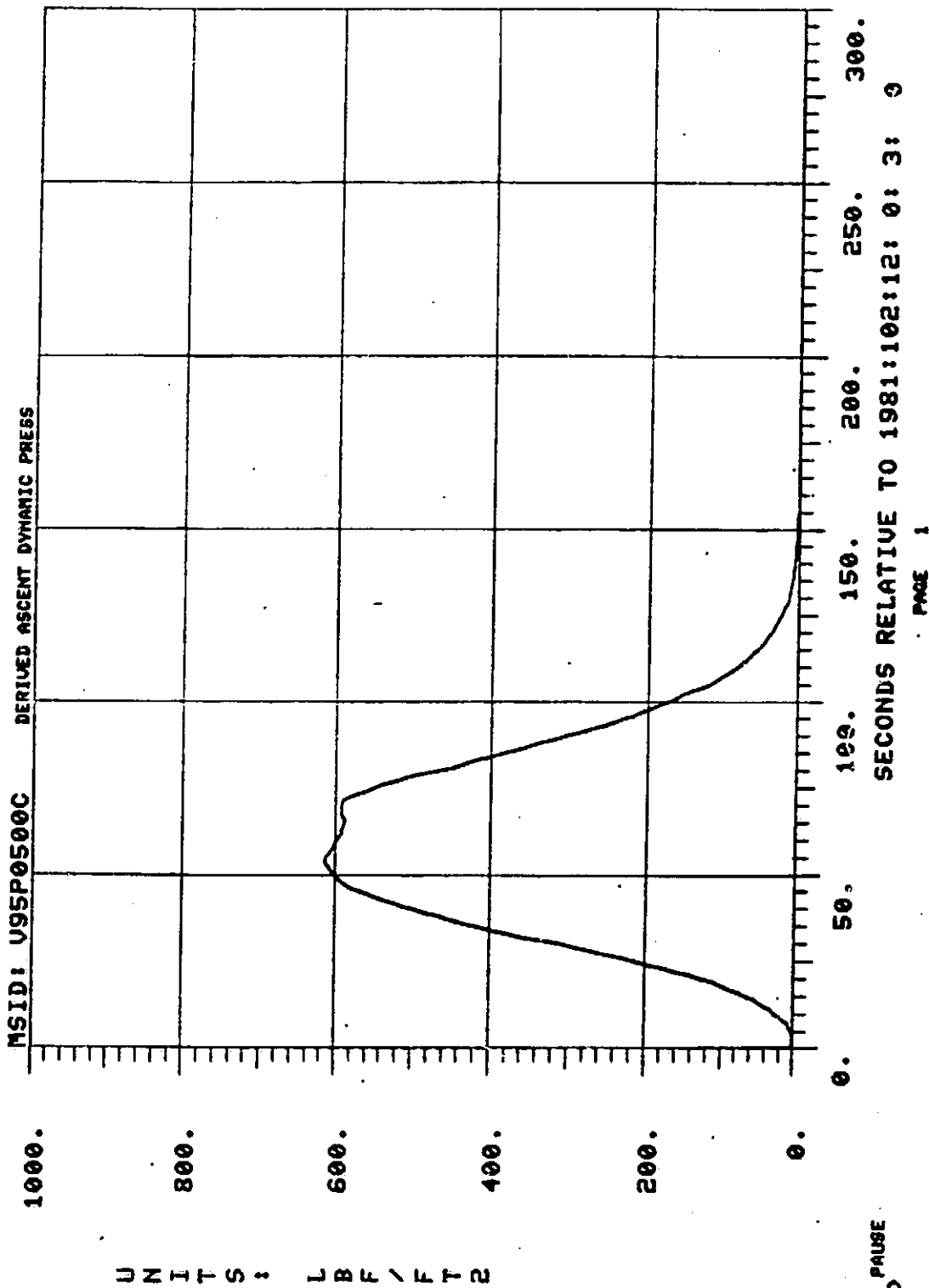
NPSP



MIPS>

STS DATA BASE: STS1JSC
LAST UPDATE: 05/01/81 08005147

DATE: 03/03/81
TIME: 15:10:57



ORIGINAL FILED IN
OF POOR QUALITY

STS-1 POGO MEASUREMENTS

ENGINE	MEASUREMENT	UNITS	ID	QUALITY
ME-1	LPOTP INLET PRESS	PSI	V41P9195A	QUESTIONABLE
	ACCUM PRESS	PSI	E41P9196A	GOOD
	HPOTP INLET PRESS	PSI	E41P9197A	BAD
	MCC PRESS	PSI	E41P9199A	GOOD
	GIMBAL PAD \ddot{X}	G's	V08D9451A	GOOD
	GIMBAL PAD \ddot{Y}	G's	V08D9452A	GOOD
	GIMBAL PAD \ddot{Z}	G's	V08D9453A	GOOD
ME-2	LPOTP INLET PRESS	PSI	V41P9295A	QUESTIONABLE
	ACCUM PRESS	PSI	E41P9296A	QUESTIONABLE
	HPOTP INLET PRESS	PSI	E41P9297A	GOOD
	MCC PRESS	PSI	E41P9299A	GOOD
	GIMBAL PAD \ddot{X}	G's	V08D9454A	GOOD
	GIMBAL PAD \ddot{Y}	G's	V08D9455A	GOOD
	GIMBAL PAD \ddot{Z}	G's	V08D9456A	GOOD
ME-3	LPOTP INLET PRESS	PSI	V41P9395A	GOOD
	ACCUM PRESS	PSI	E41P9396A	BAD
	HPOTP INLET PRESS	PSI	EVIP9397A	QUESTIONABLE
	MCC PRESS	PSI	EVIP9399A	GOOD
	GIMBAL PAD \ddot{X}	G's	V08D9457A	GOOD
	GIMBAL PAD \ddot{Y}	G's	V08D9458A	GOOD
	GIMBAL PAD \ddot{Z}	G's	V08D9459A	GOOD

STS-1 POGO MEASUREMENTS (CONT'D)

SYSTEM	MEASUREMENT	UNITS	ID	QUALITY
LOX	LOX TK OUTLET PRESS	PSI	T41P9095A	GOOD
	LOX FEED MANIFOLD PR.	PSI	V41P9400A	BAD
	LOX TK BOT \ddot{x}	G's	TO8D9943A	GOOD
	LOX TK BOT \ddot{y}	G's	TO8D9944A	GOOD
	LOX TK BOT \ddot{z}	G's	TO8D9945A	GOOD
FUEL	LH2 TK BOT \ddot{x}	G's	TO8D9946A	GOOD
	LH2 TK BOT \ddot{y}	G's	TO8D9947A	GOOD
	LH2 TK BOT \ddot{z}	G's	TO8D9948A	GOOD

ORGANIZATION: SYSTEMS DYNAMICS LABORATORY	MARSHALL SPACE FLIGHT CENTER STS-1 POGO ANALYSIS		NAME: R. JEWELL
			DATE: MAY 1981

DATA ANALYSIS TIME INTERVALS

<u>CONDITION</u>	<u>TIME FROM LIFTOFF (SEC)</u>	<u>NPSP (PSI)</u>	<u>PWL (%)</u>
BEFORE MAX Q	14-30	106-118	100
MAX Q	50-61	98-108	65
83 SEC EVENT	83-86	139-146	100
BEFORE SRB SEP	85-105	138-150	100
AFTER SRB SEP	135-215	40-56	100
BEFORE MECO	380-450	90-146	100

ORGANIZATION:	SYSTEMS DYNAMICS LABORATORY	MARSHALL SPACE FLIGHT CENTER	NAME: R. JEWELL
		STS-1 POGO ANALYSIS	DATE: MAY 1981

TYPICAL STS-1 PSD ANALYSIS (PRESSURE)

- 0 LPOP, HPOP, MCC, ACCUMULATOR
 - *14-30 SEC BEFORE MAX R
 - *89-99 SEC BEFORE SRB SEPARATION!
 - *383-423 SEC BEFORE MECO
- 0 LOW FREQUENCY ROLLOFF OF HPOP
- 0 LOX TANK OUTLET

ME-2.4MAY81 DC COUPLED
STS-1 POGO R+1+ TO R+24

LPOP PSD

10N

0

-1

-2

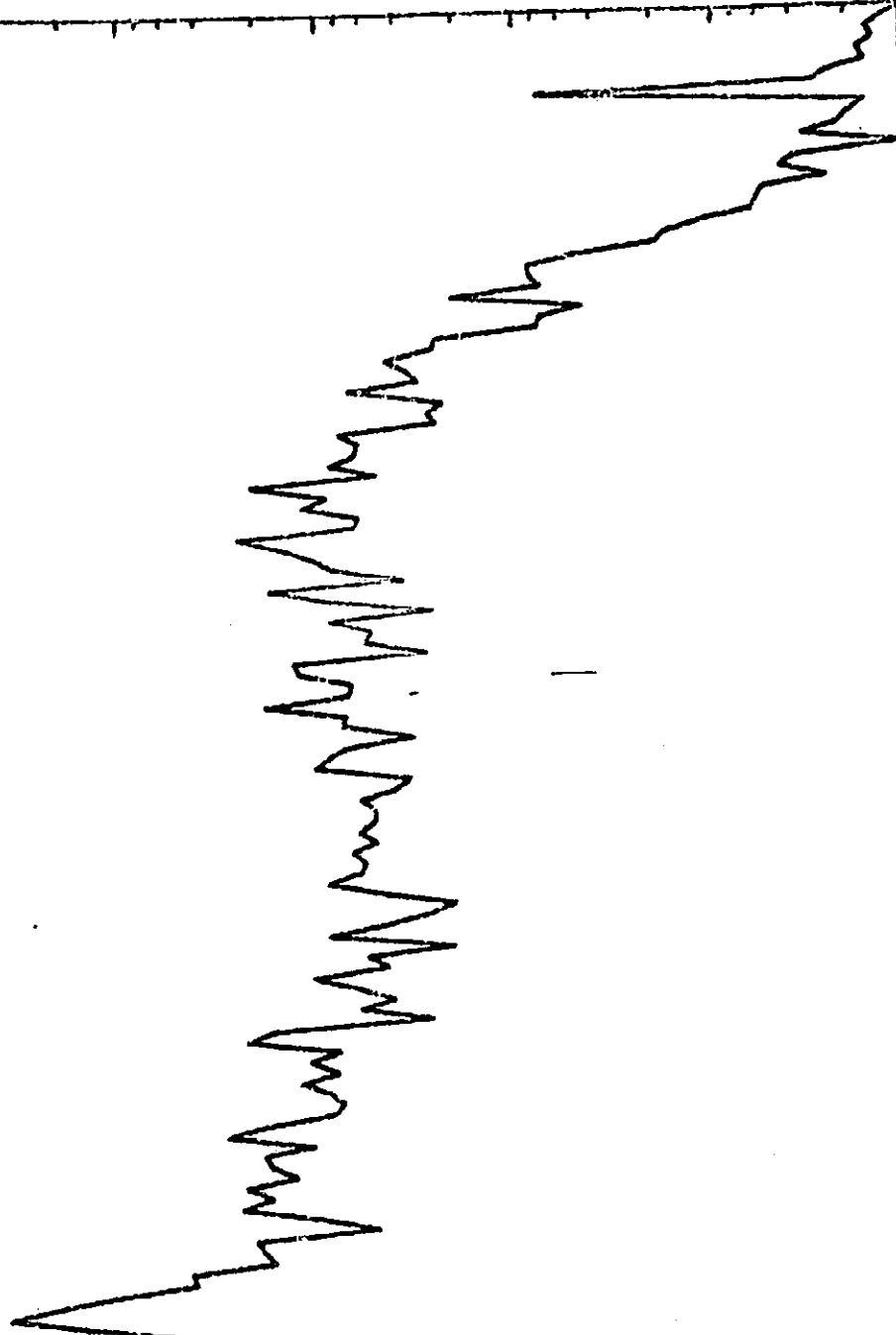
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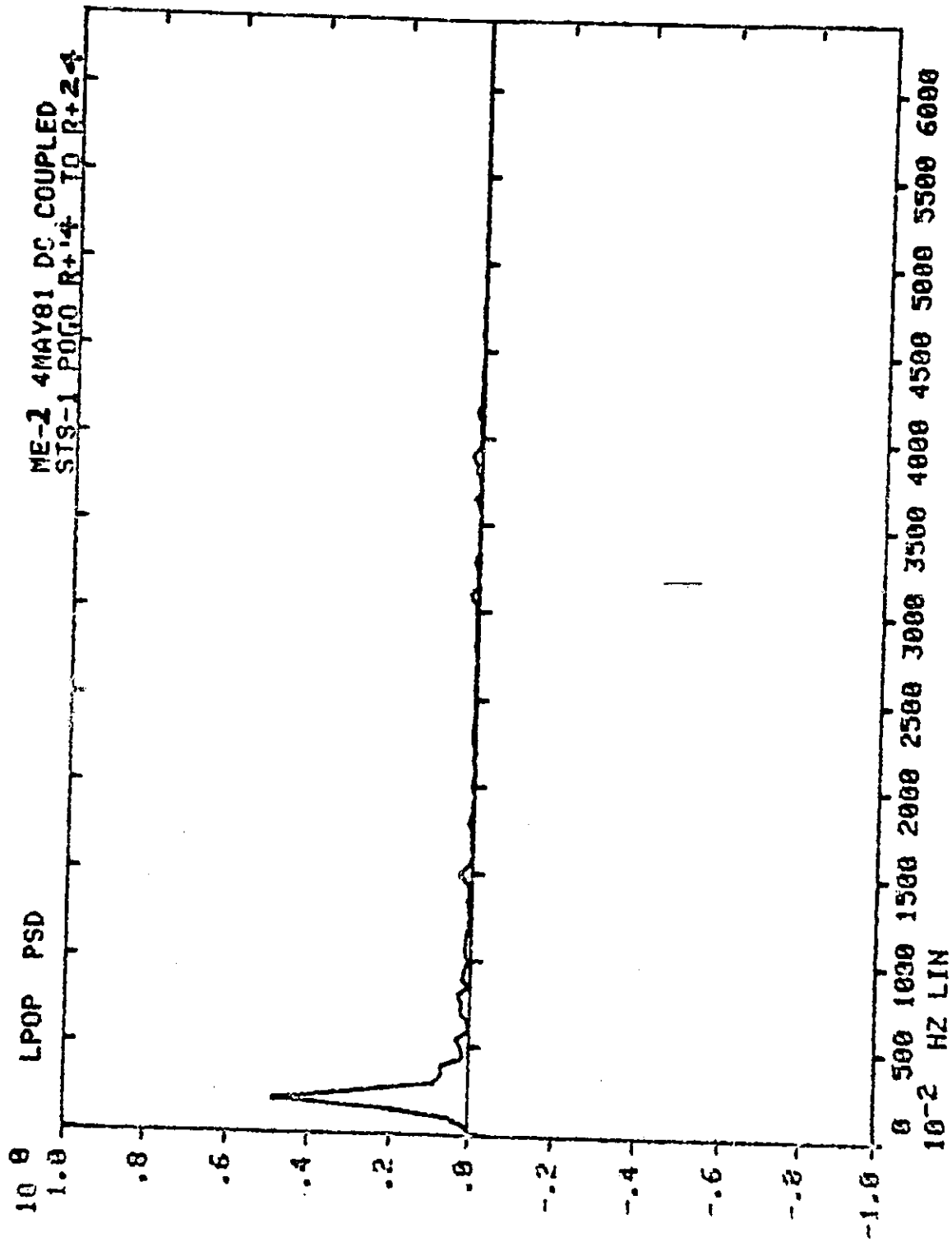
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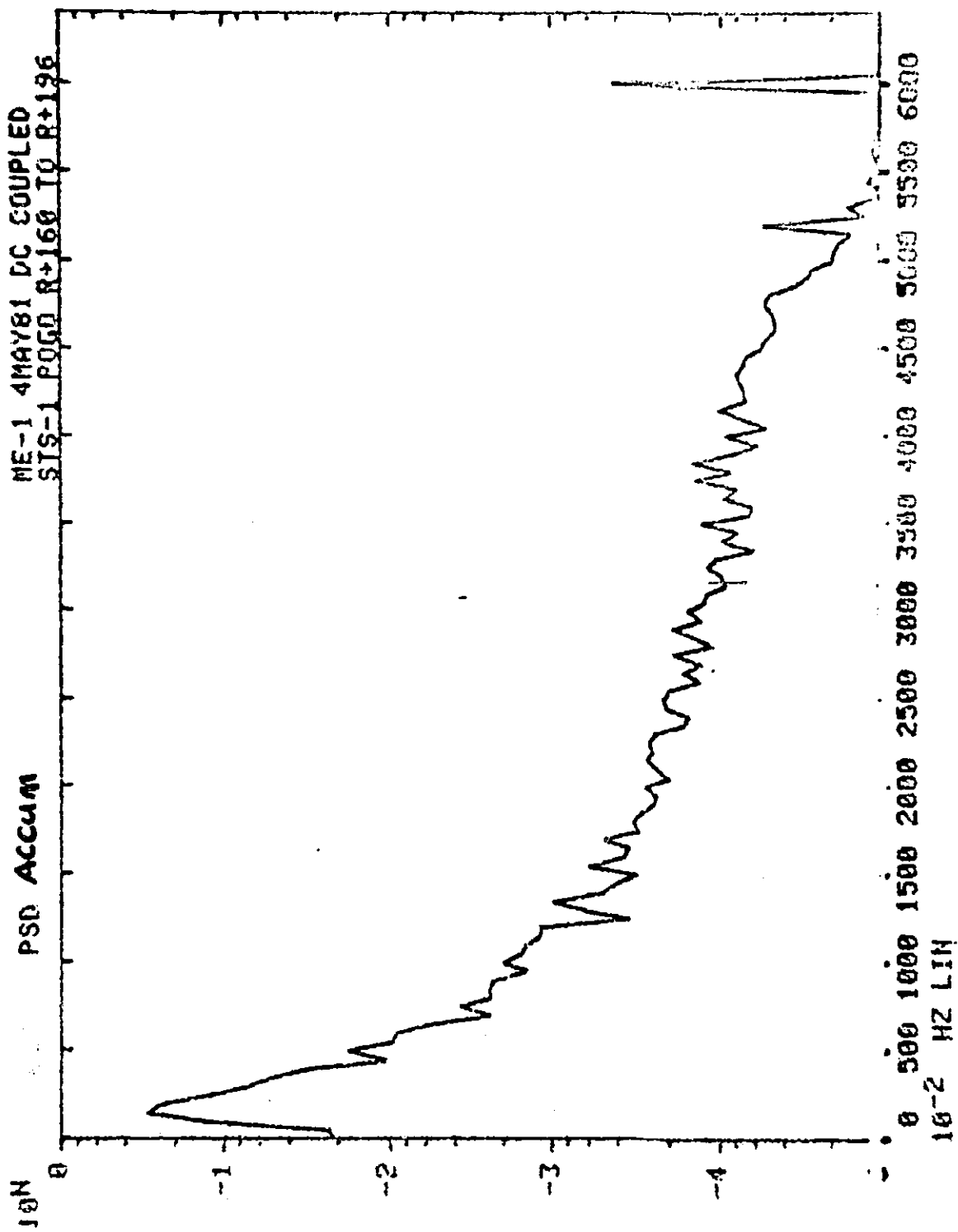
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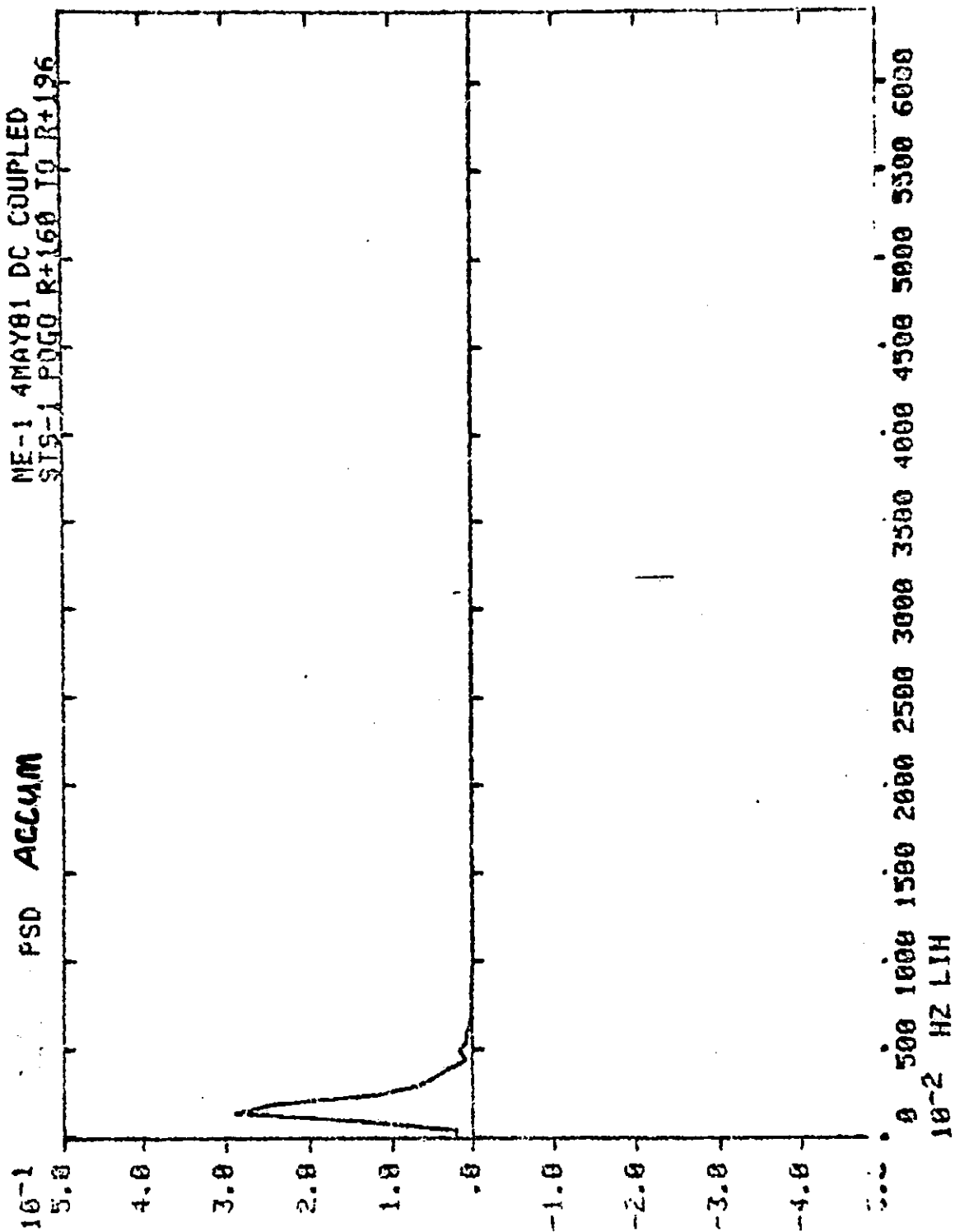
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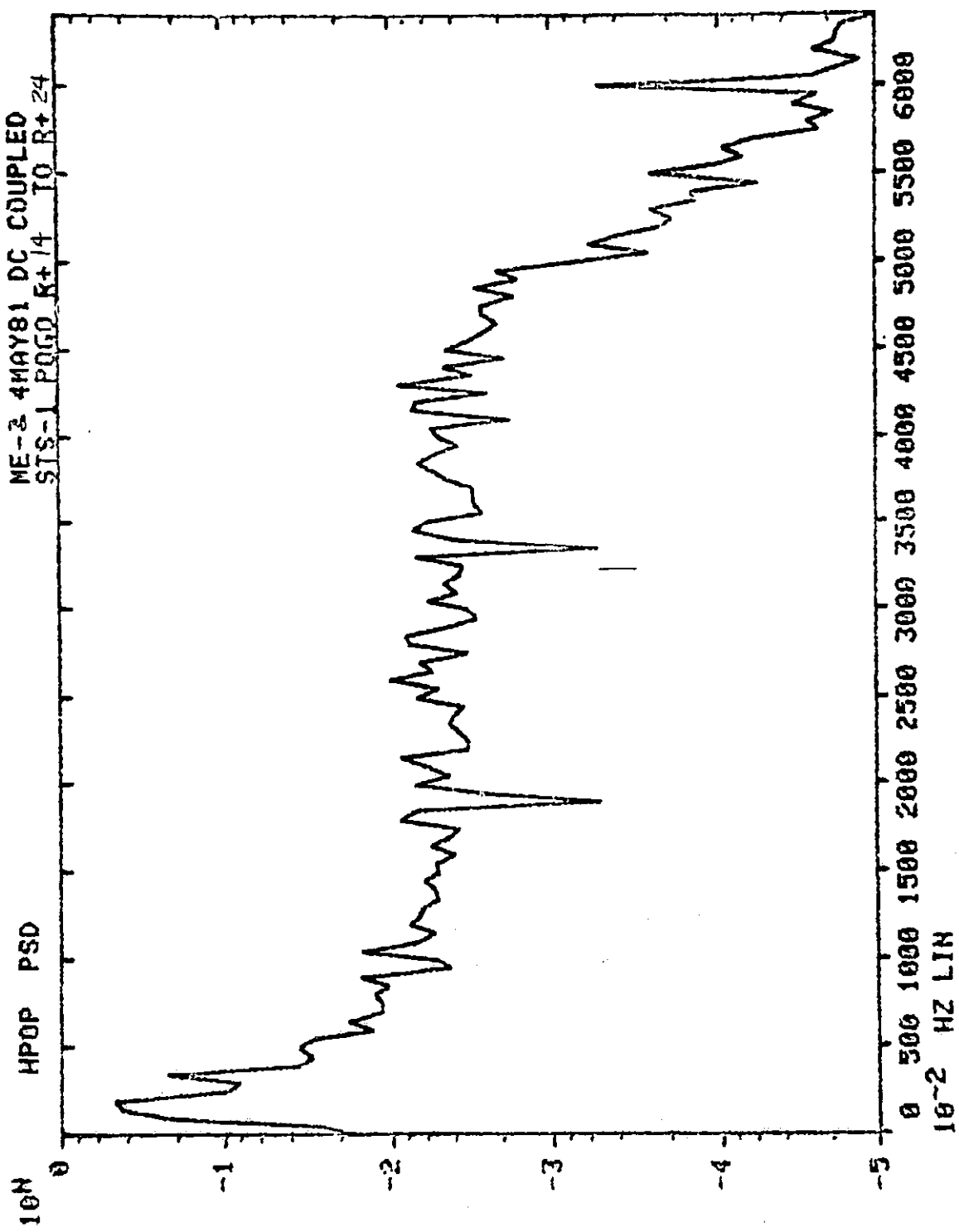
10⁻² HZ LIN

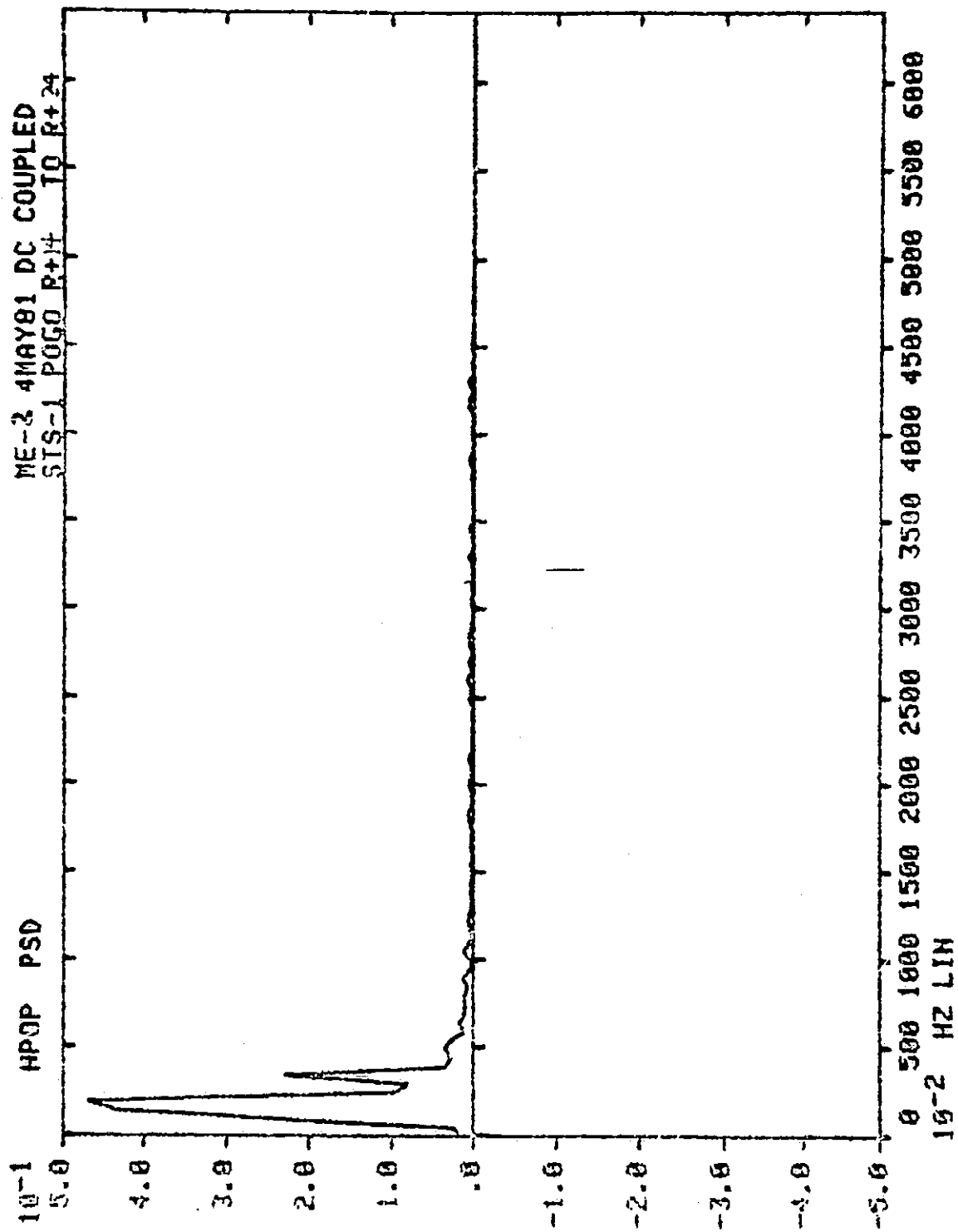


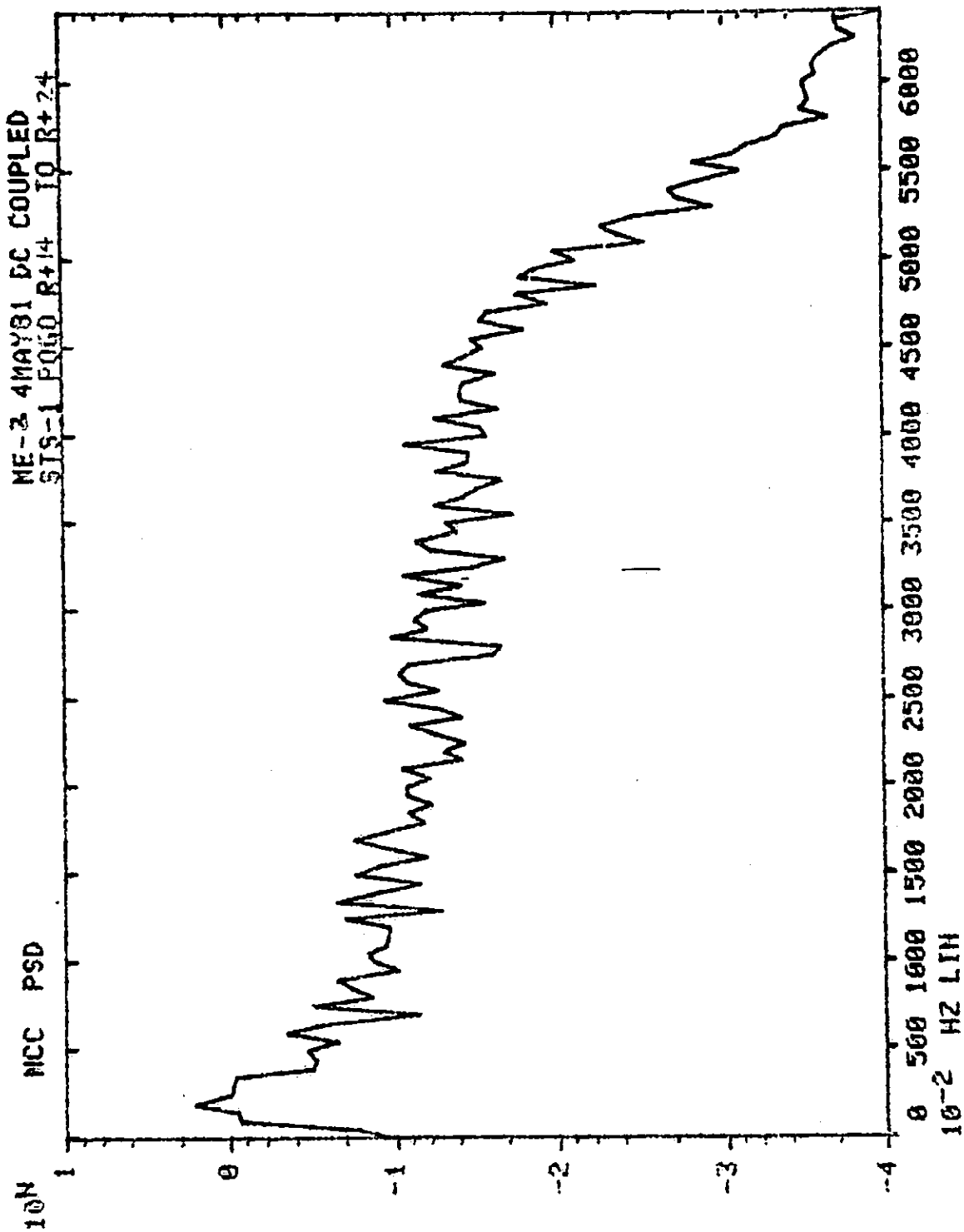


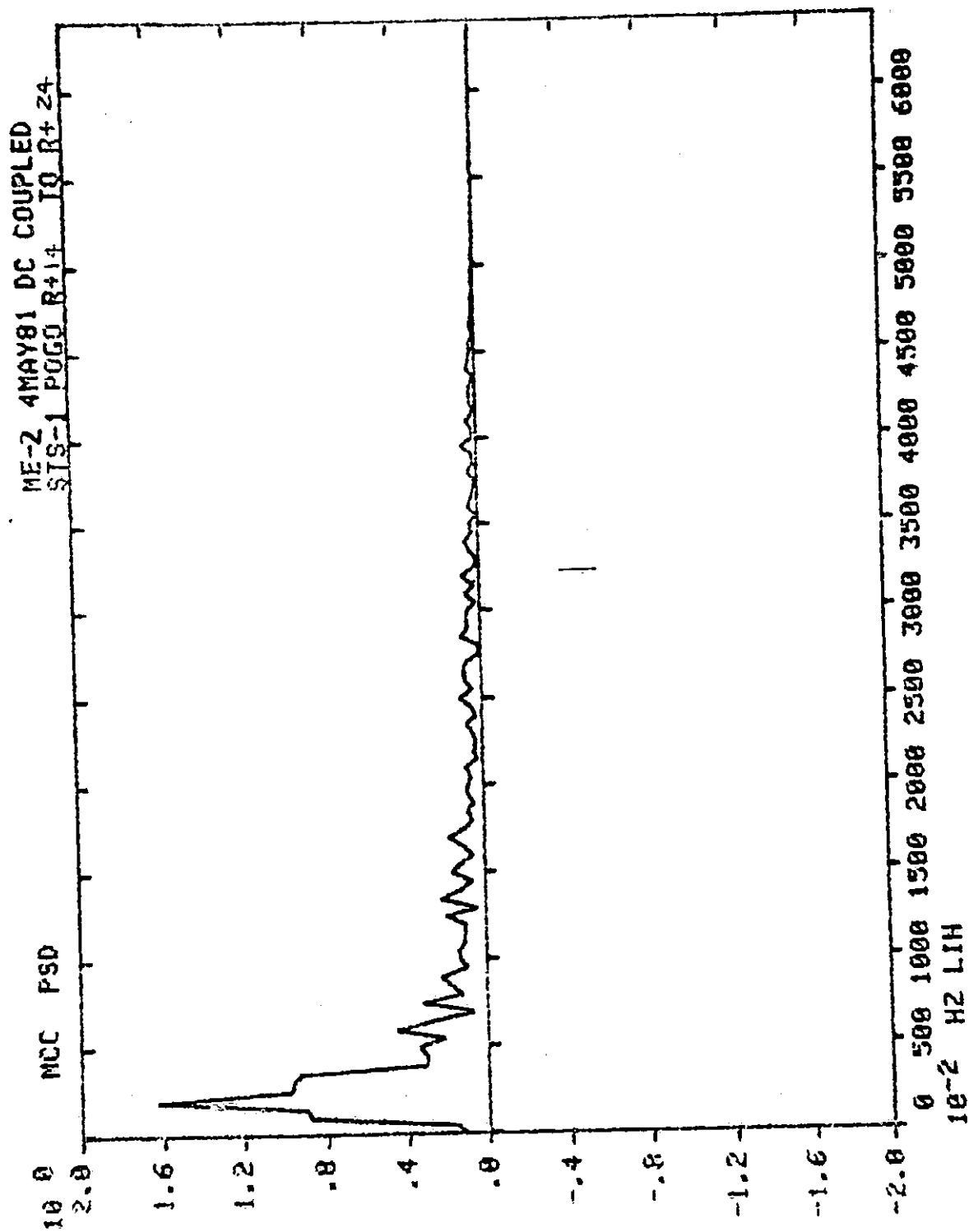








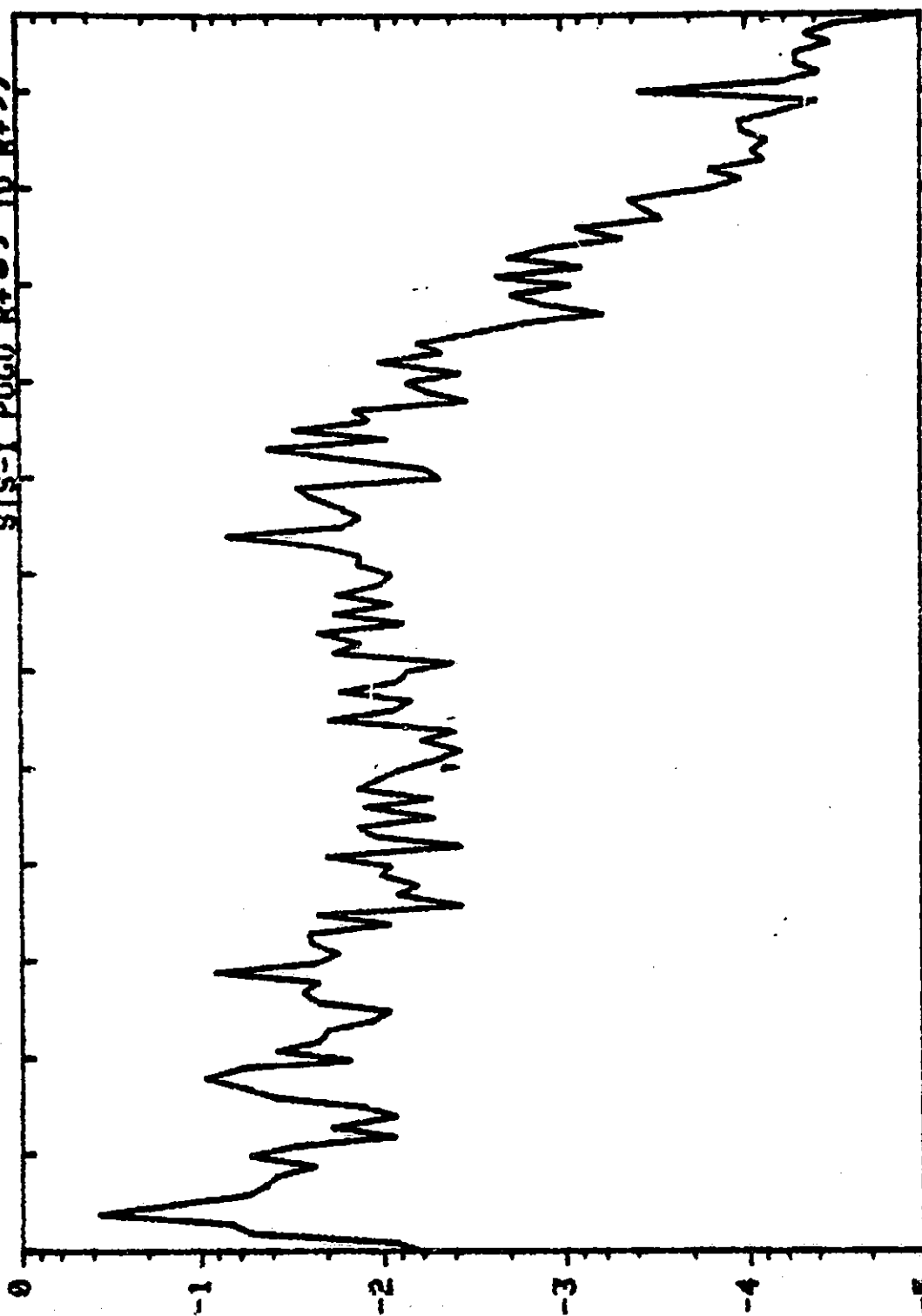




ME-2 4MAY81 DC COUPLED
STS-1 POGO R+05 TO R+99

LPOP PSD

10N



0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000
10⁻² HZ LIN

ME-2 4MAY81 DC COUPLED
STS-1 POGO R+82 TO R+92

LPOP PSD

10 0

1.0

.8

.6

.4

.2

.0

-.2

-.4

-.6

-.8

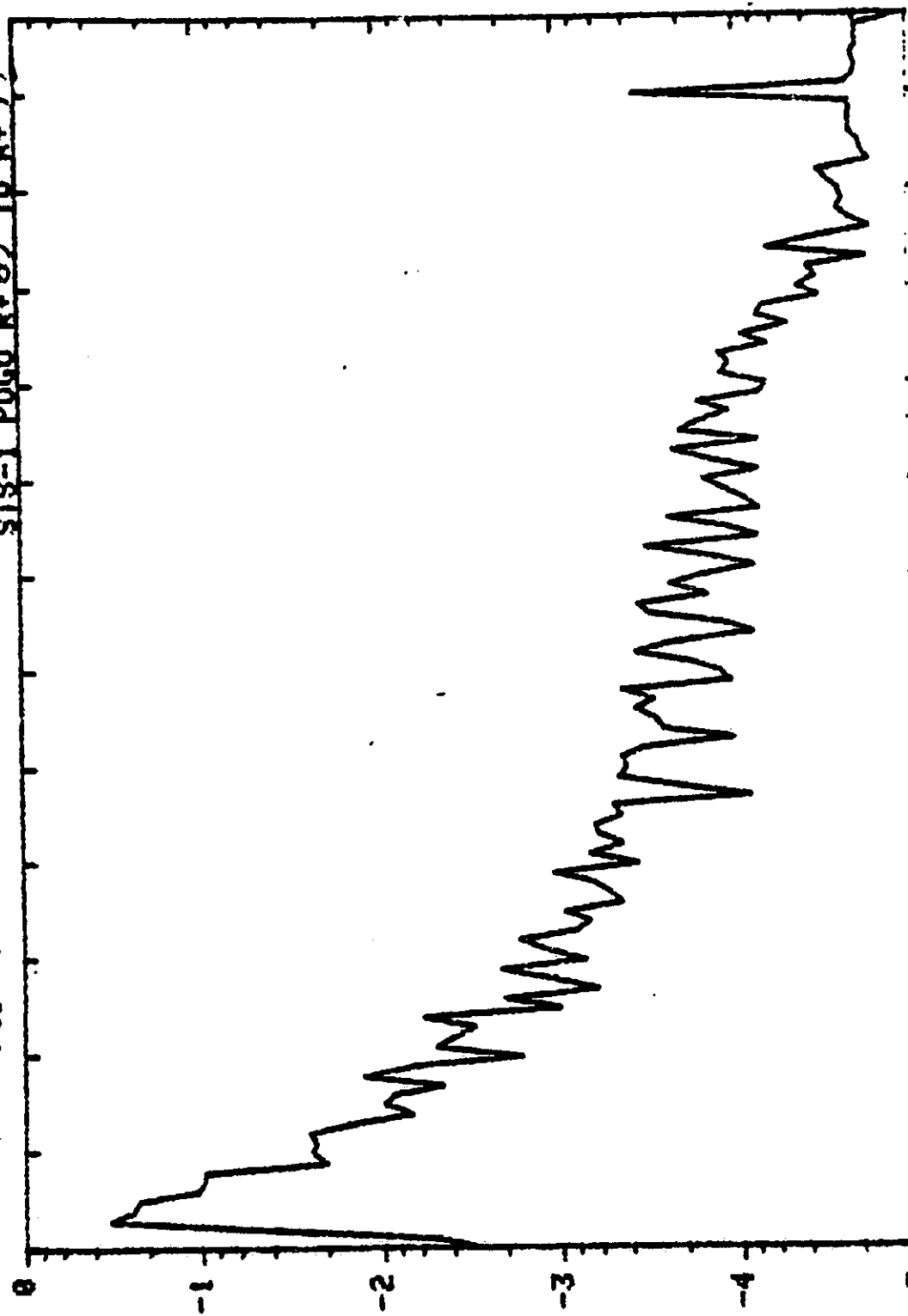
-1.0

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000
10⁻² HZ LIN

ME-1 4MAY81 DC COUPLED
STS-1 POGO R+89 IQ R+93

PSD ACCUM

10N



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10^-2 HZ LIN

ME-1 4MAY81 DC COUPLED
 STS-1 POGO R+22 TO R+

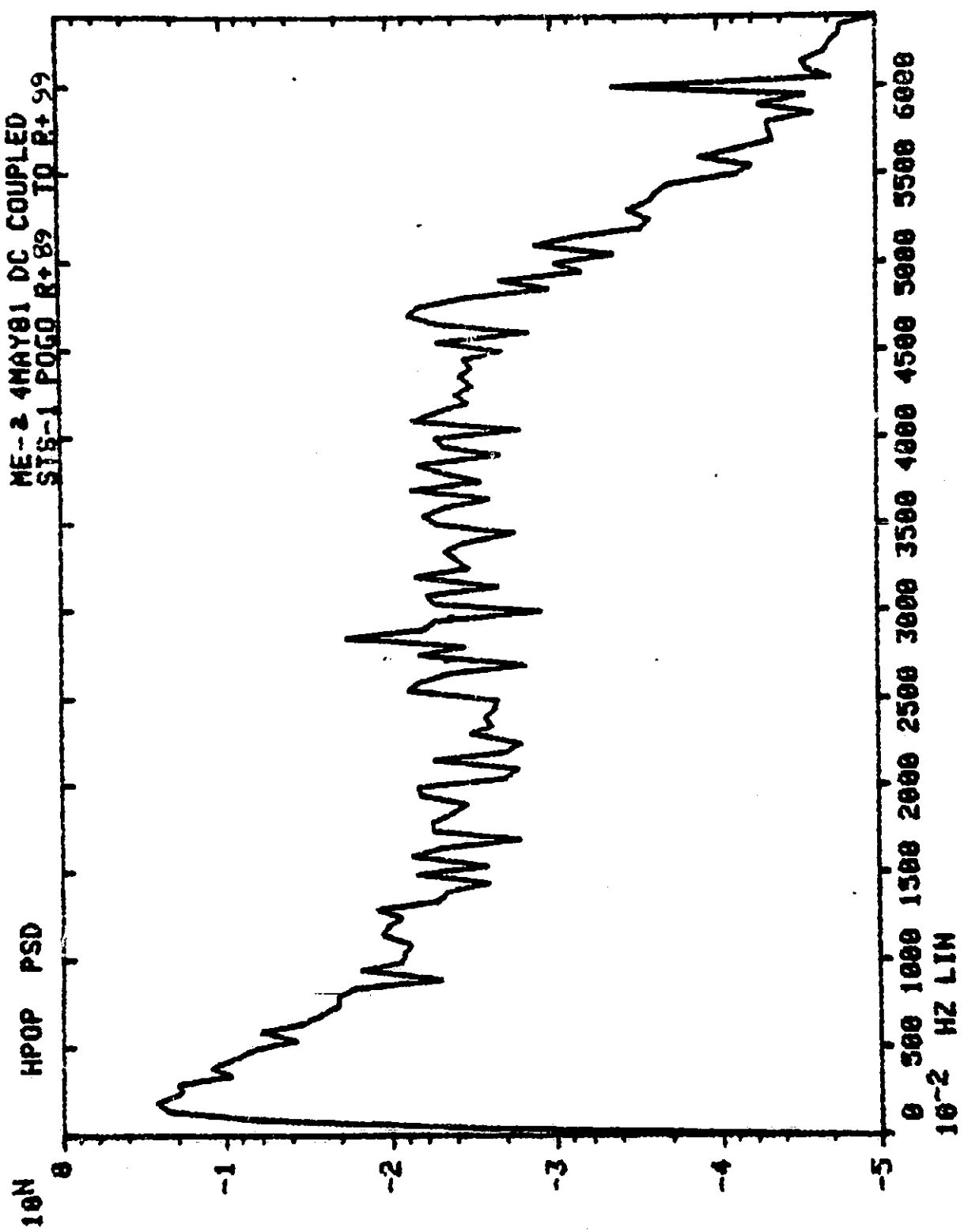
PSD Accum

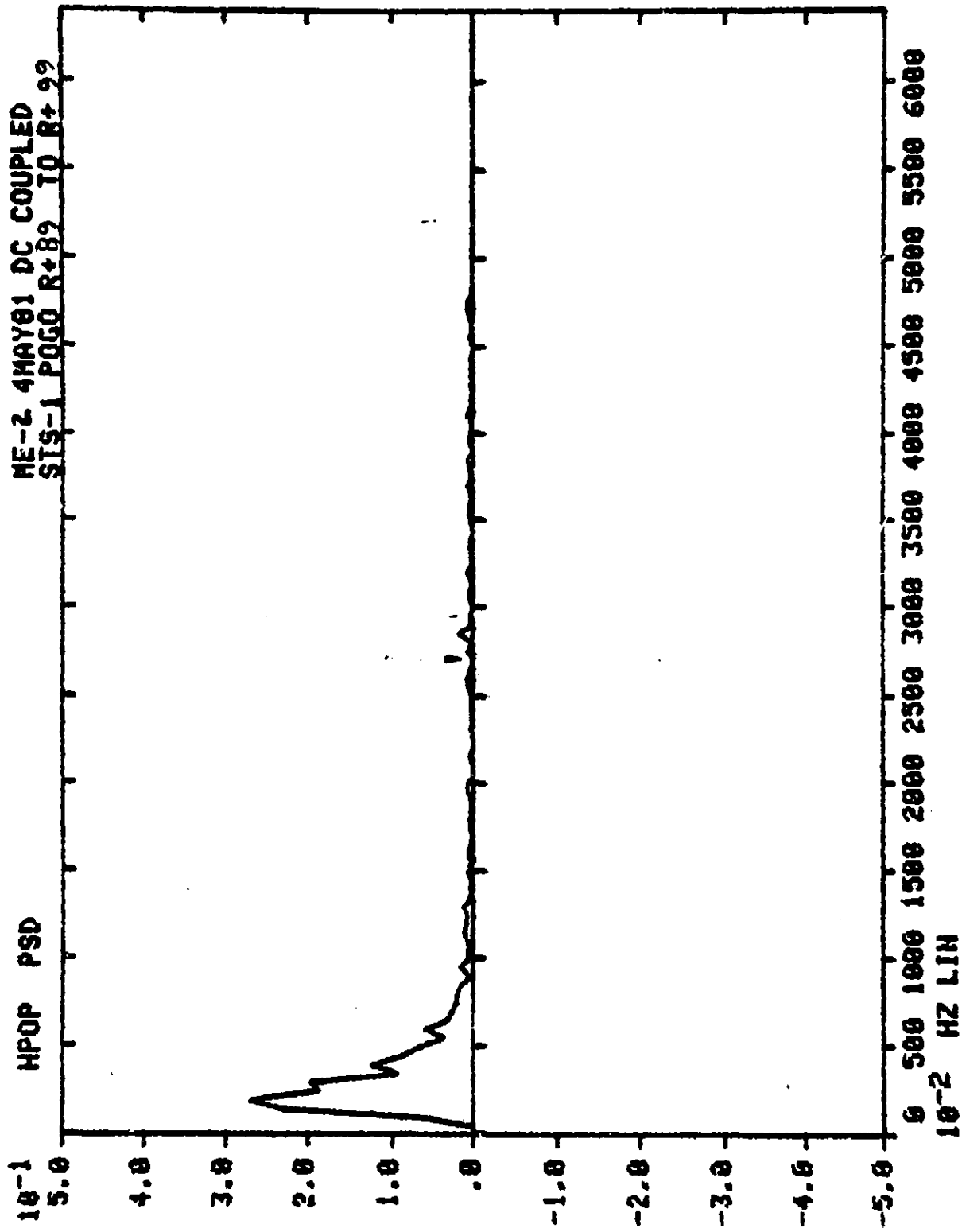
10⁻¹

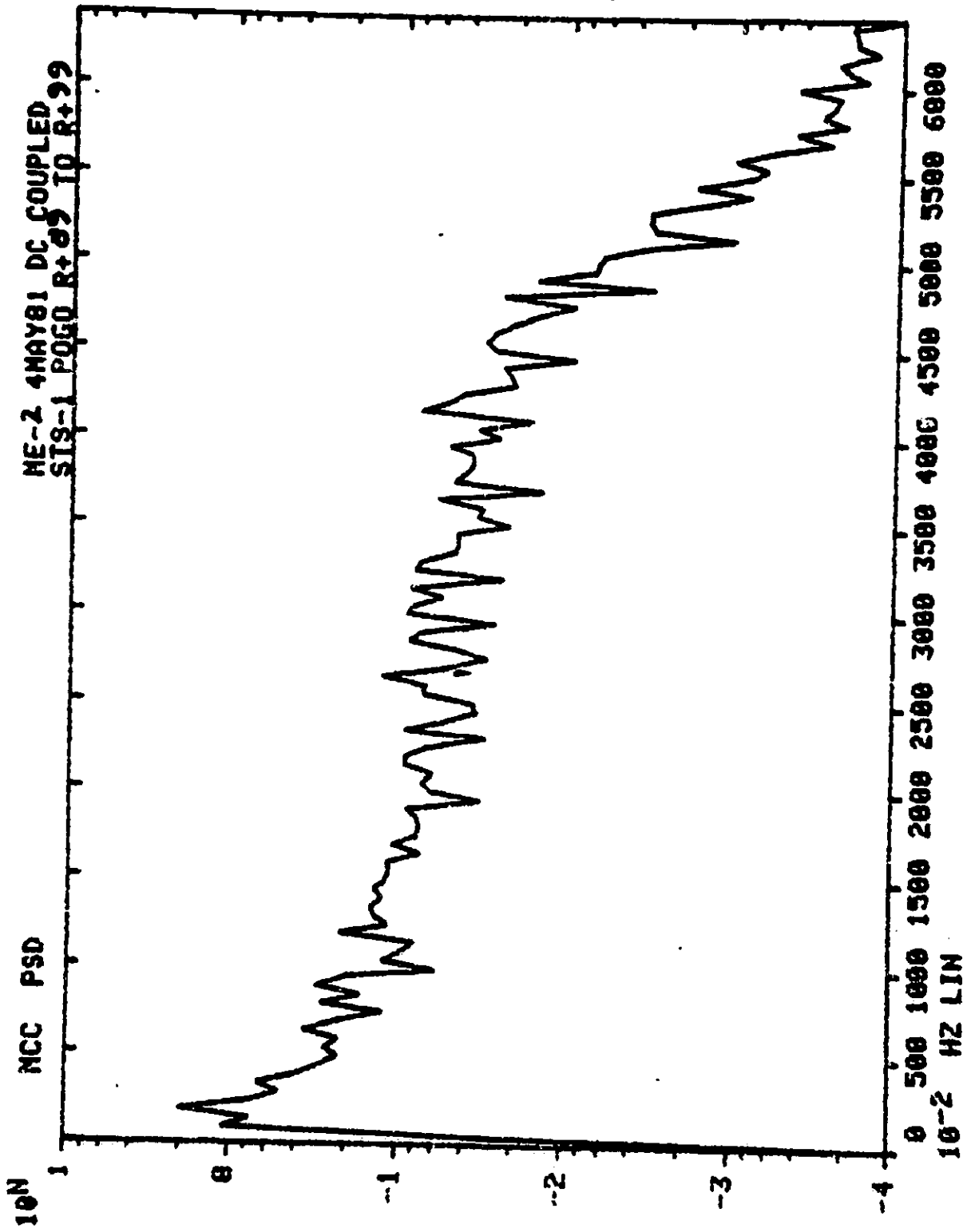
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10⁻² HZ LIN



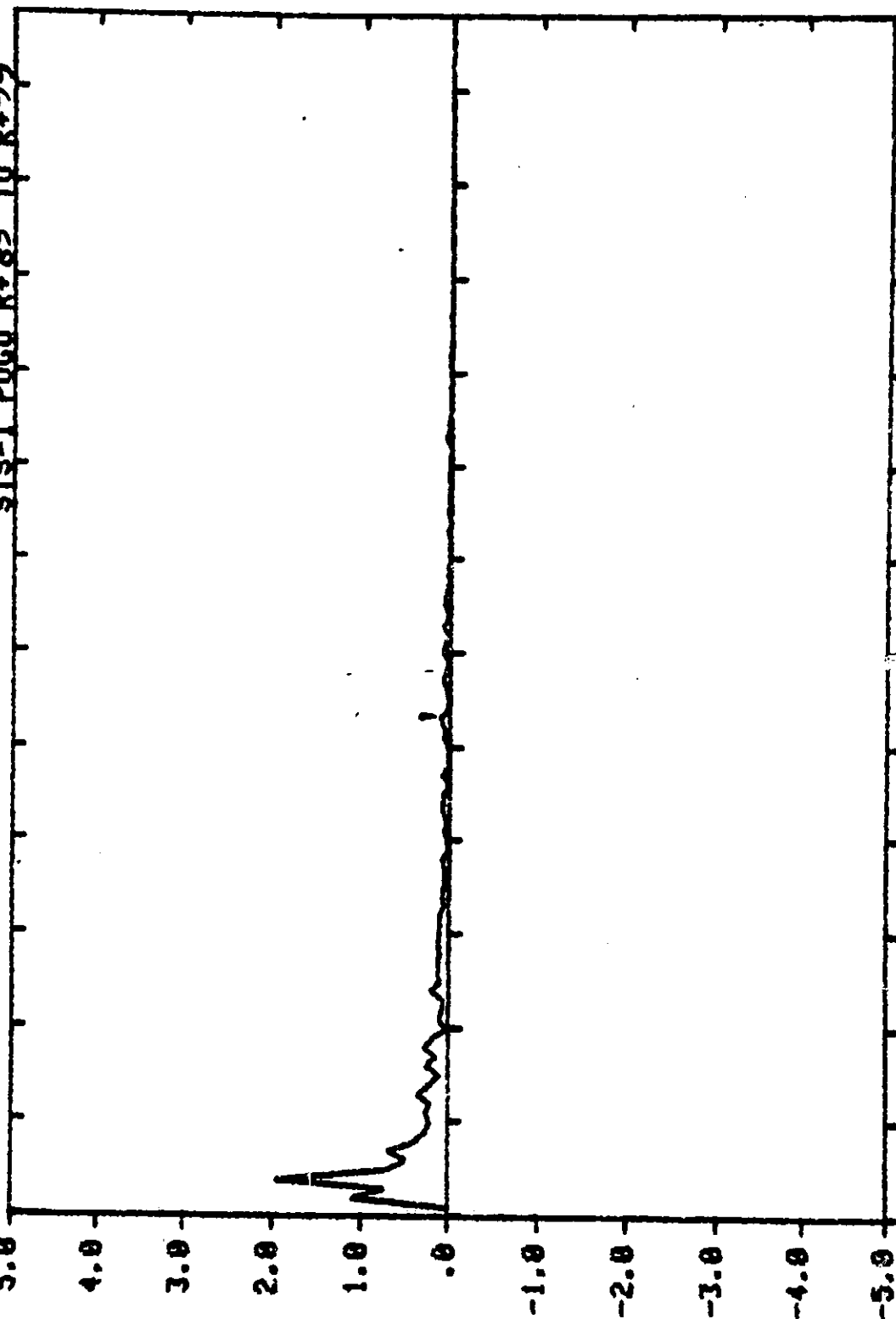




ME-2 4MAY81 DC COUPLED
STS-1 POGO R+82 IQ R+99

MCC PSD

10.0
5.0

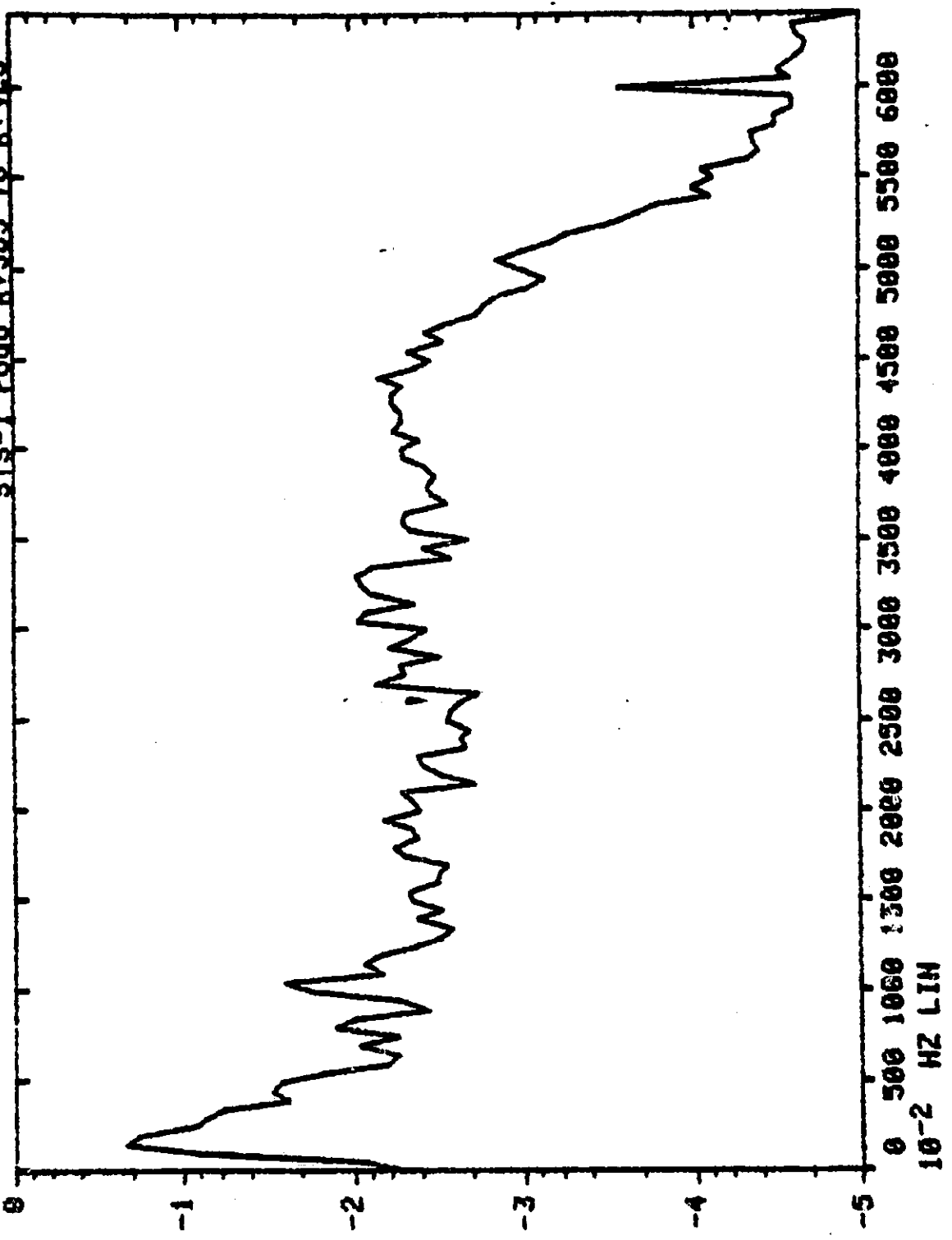


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10⁻² HZ LIN

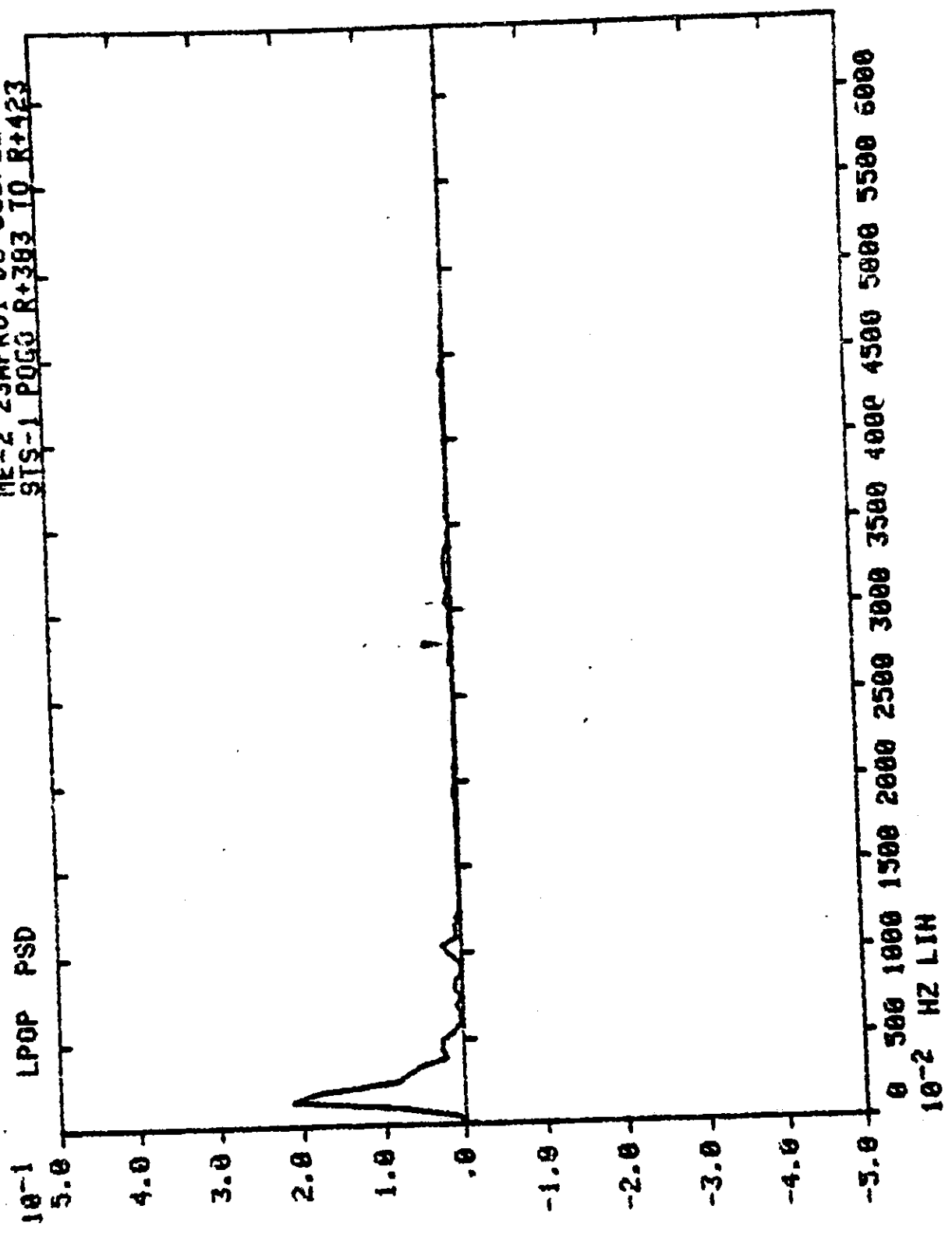
ME-2 23APR81 DC COUPLED
STS-1 POGO R+383 TO R+423

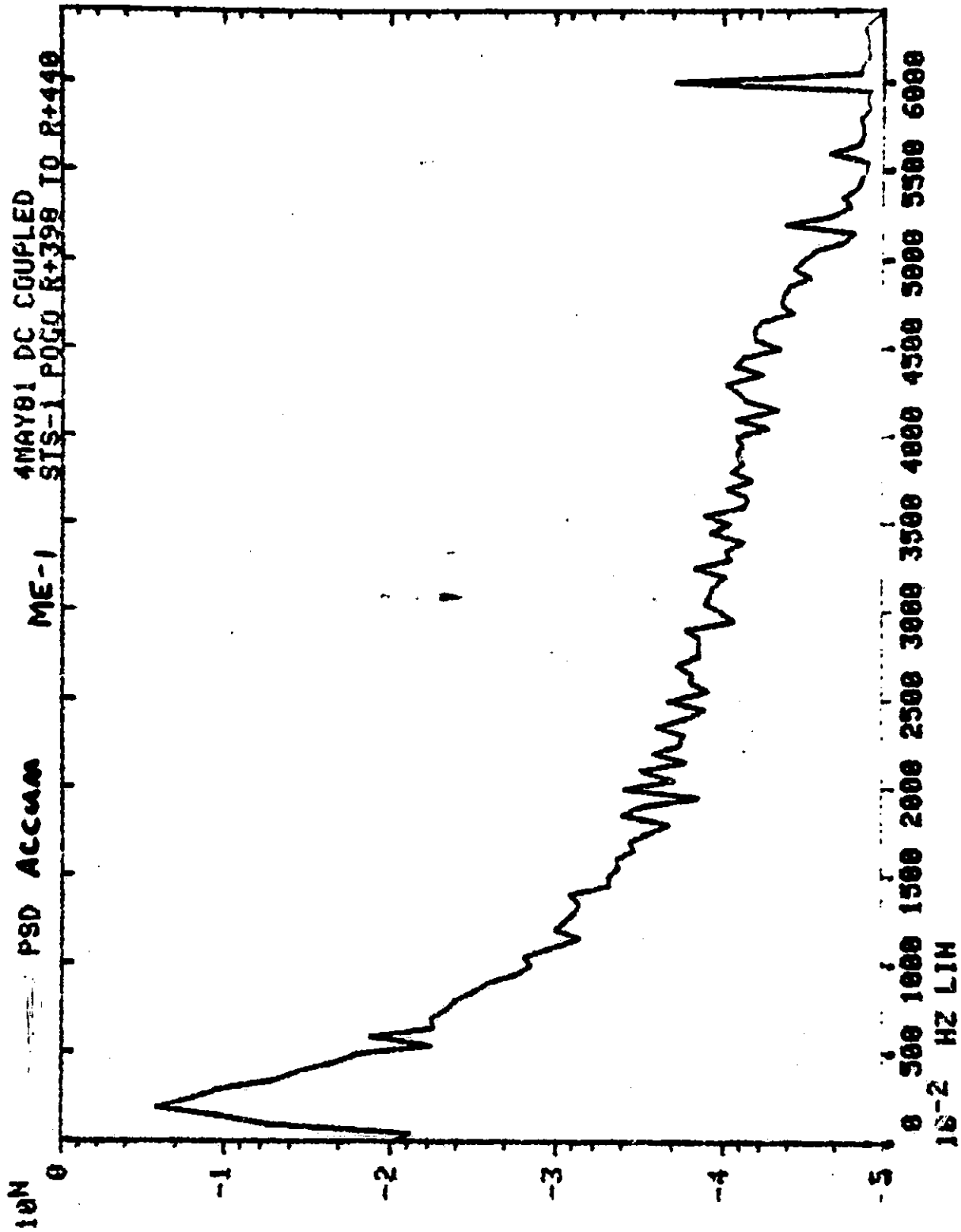
LPOP PSD

10^N

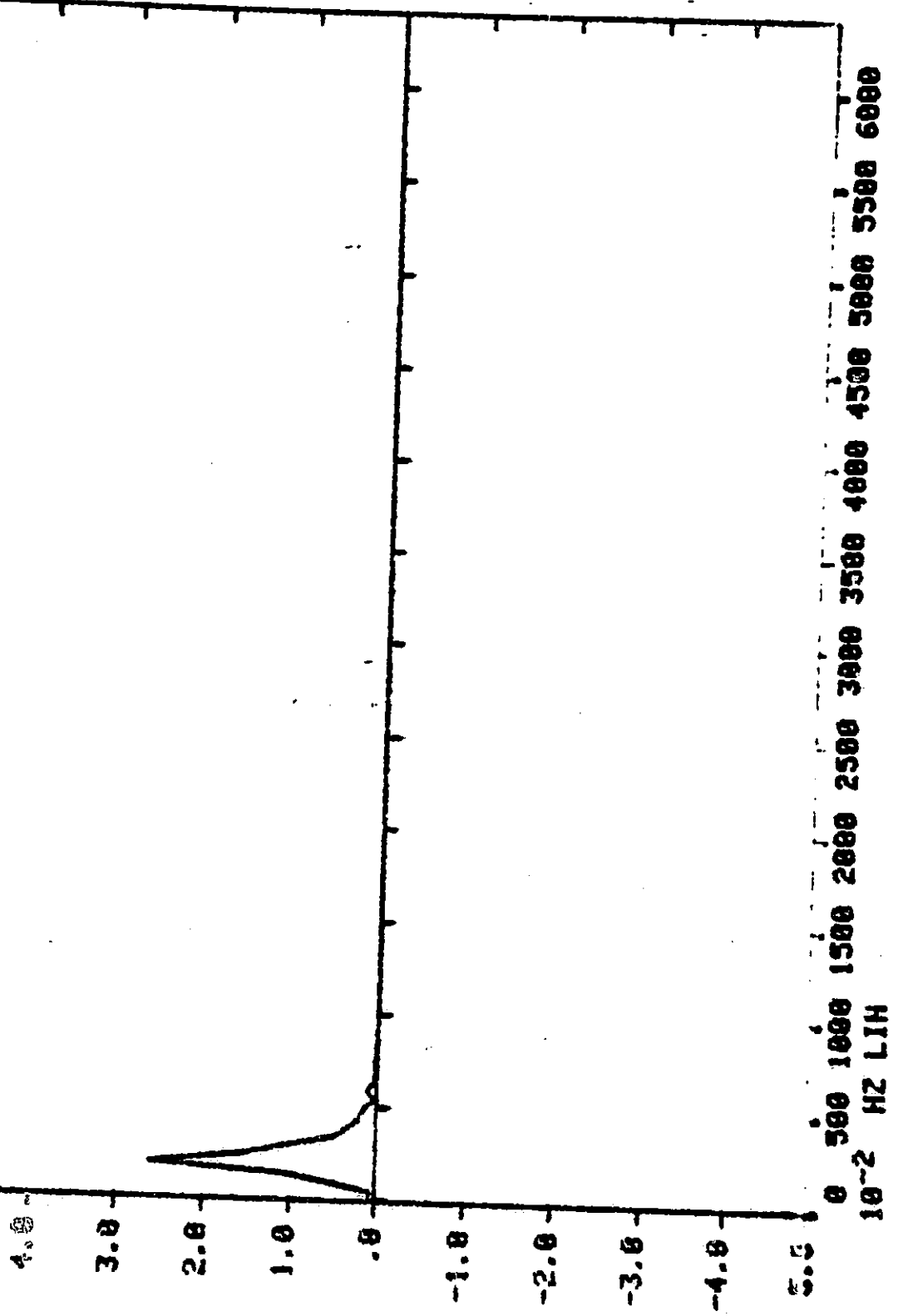


ME-2 23APR81 DC COUPLED
SIS-1 POGO R+383 TO R+423





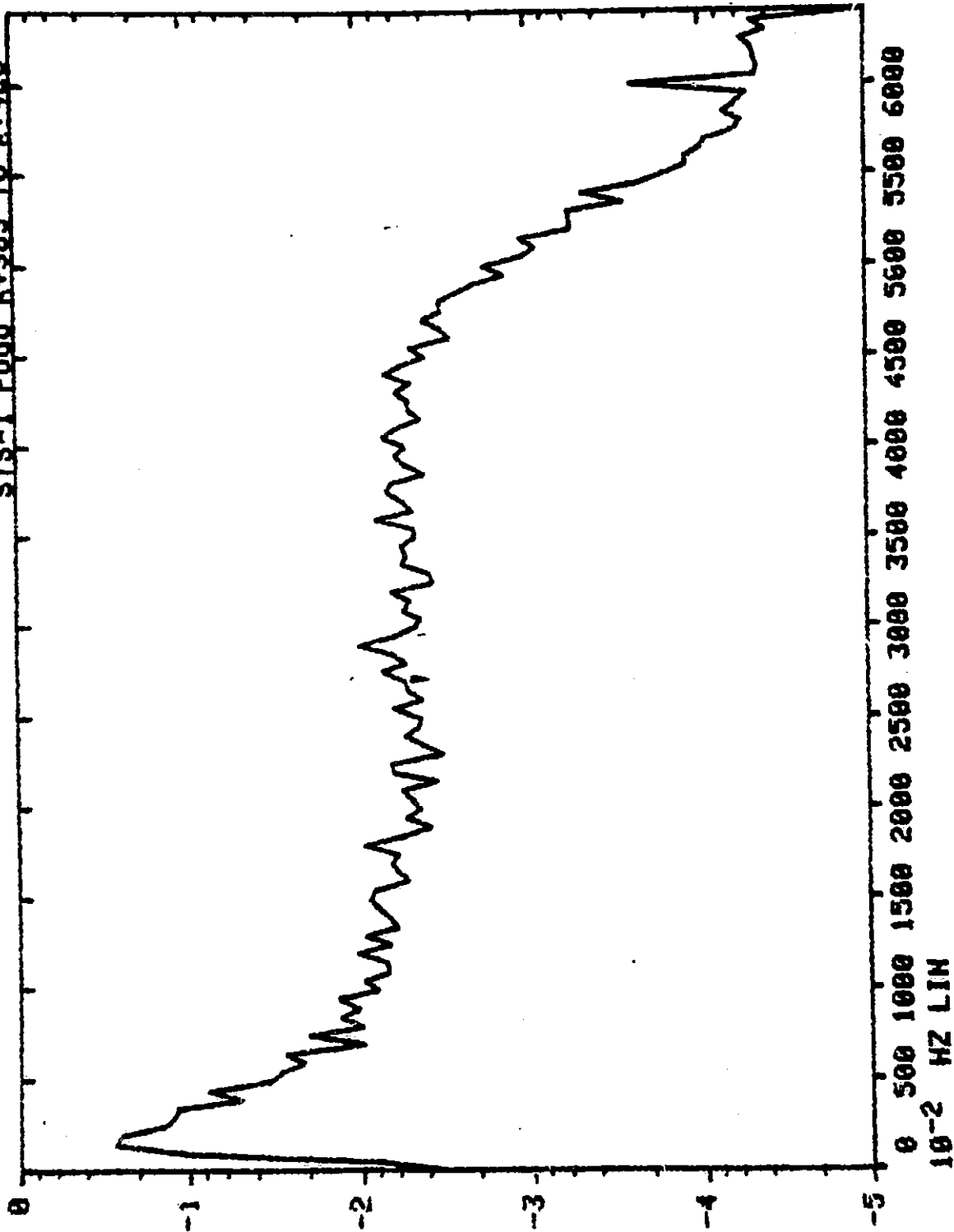
10⁻¹ PSD Accum NC-1 4MAY81 DC COUPLED
5.0 ST8-1 POGO R+398 TP R+440

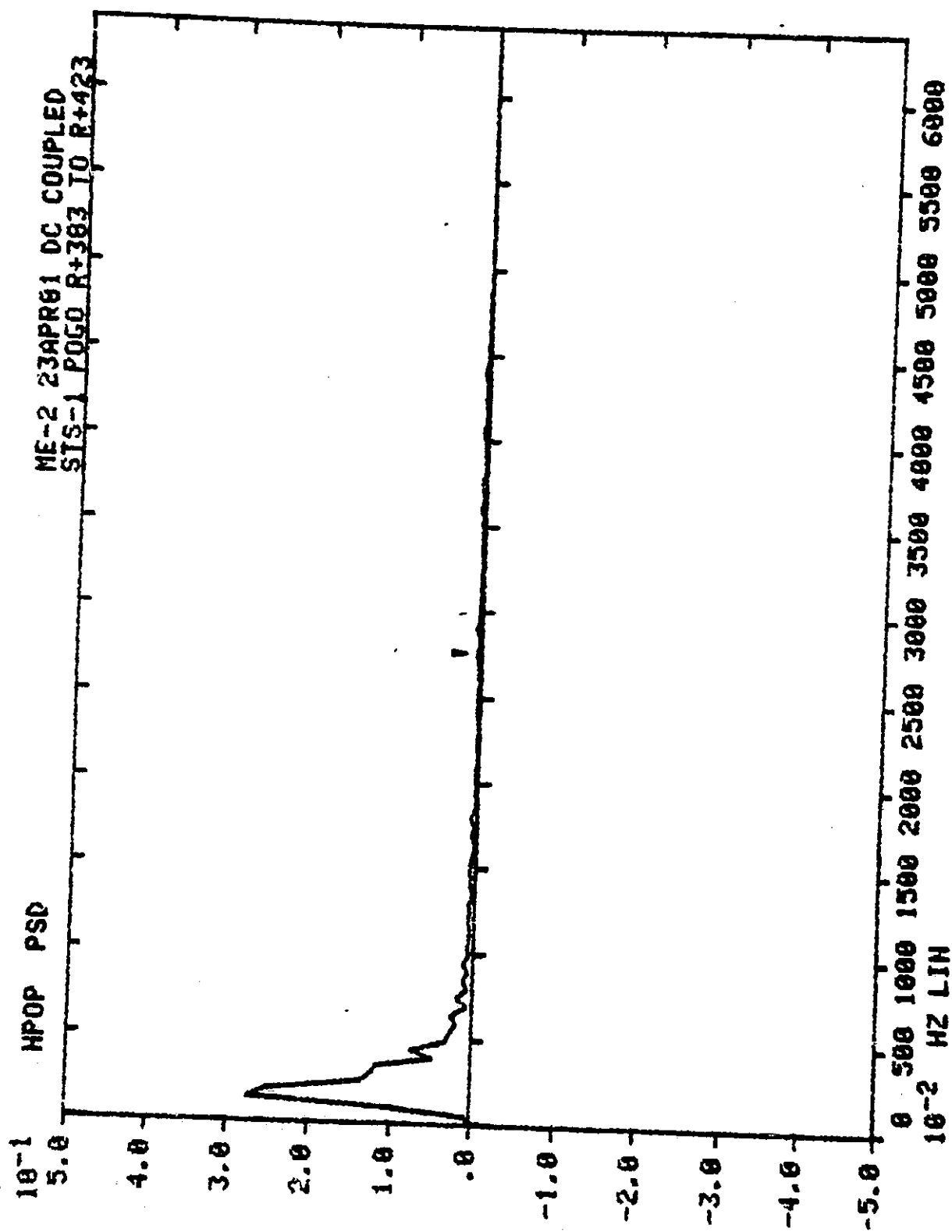


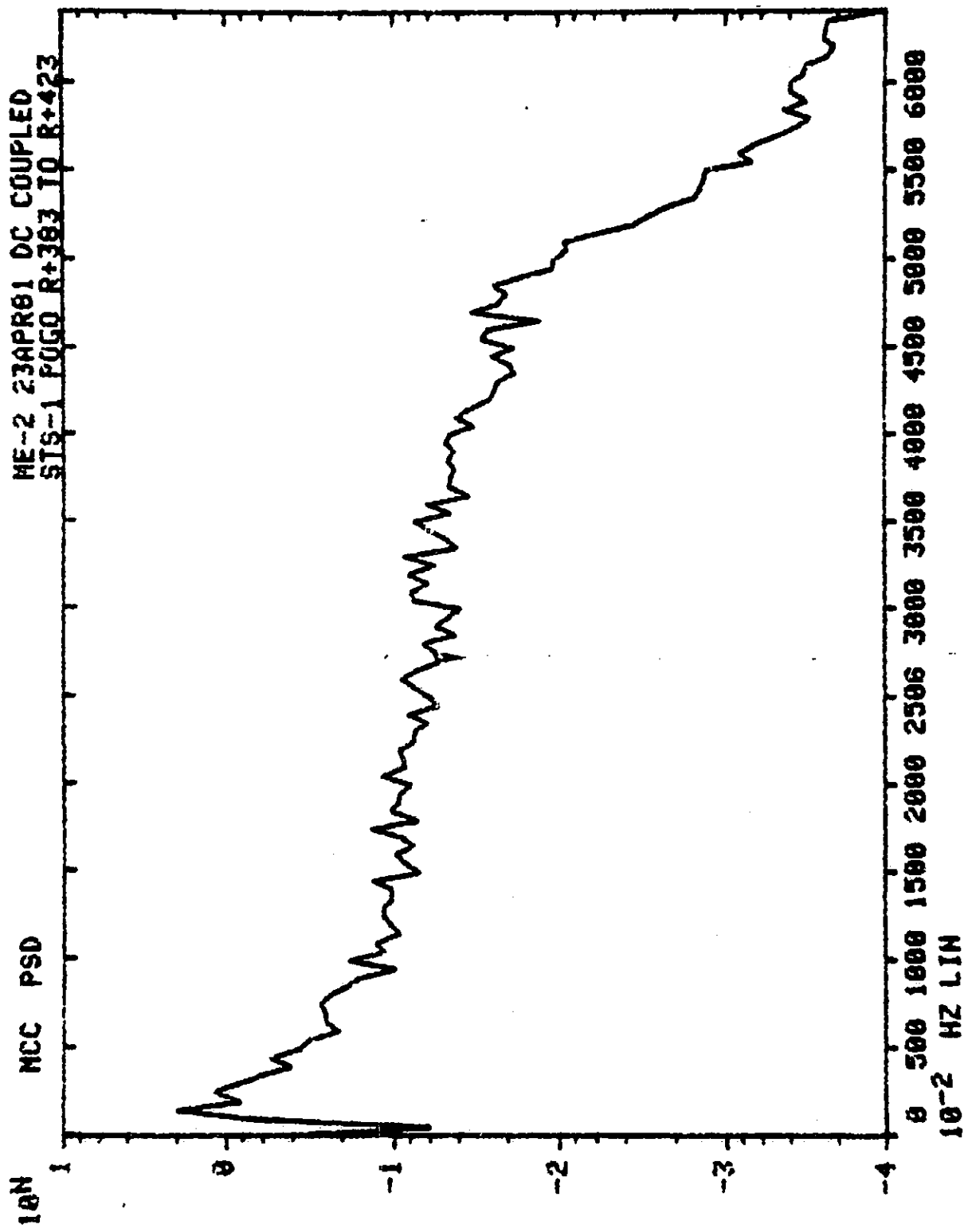
ME-2 23APR81 DC COUPLED
STS-1 POGO R+383 TO R+423

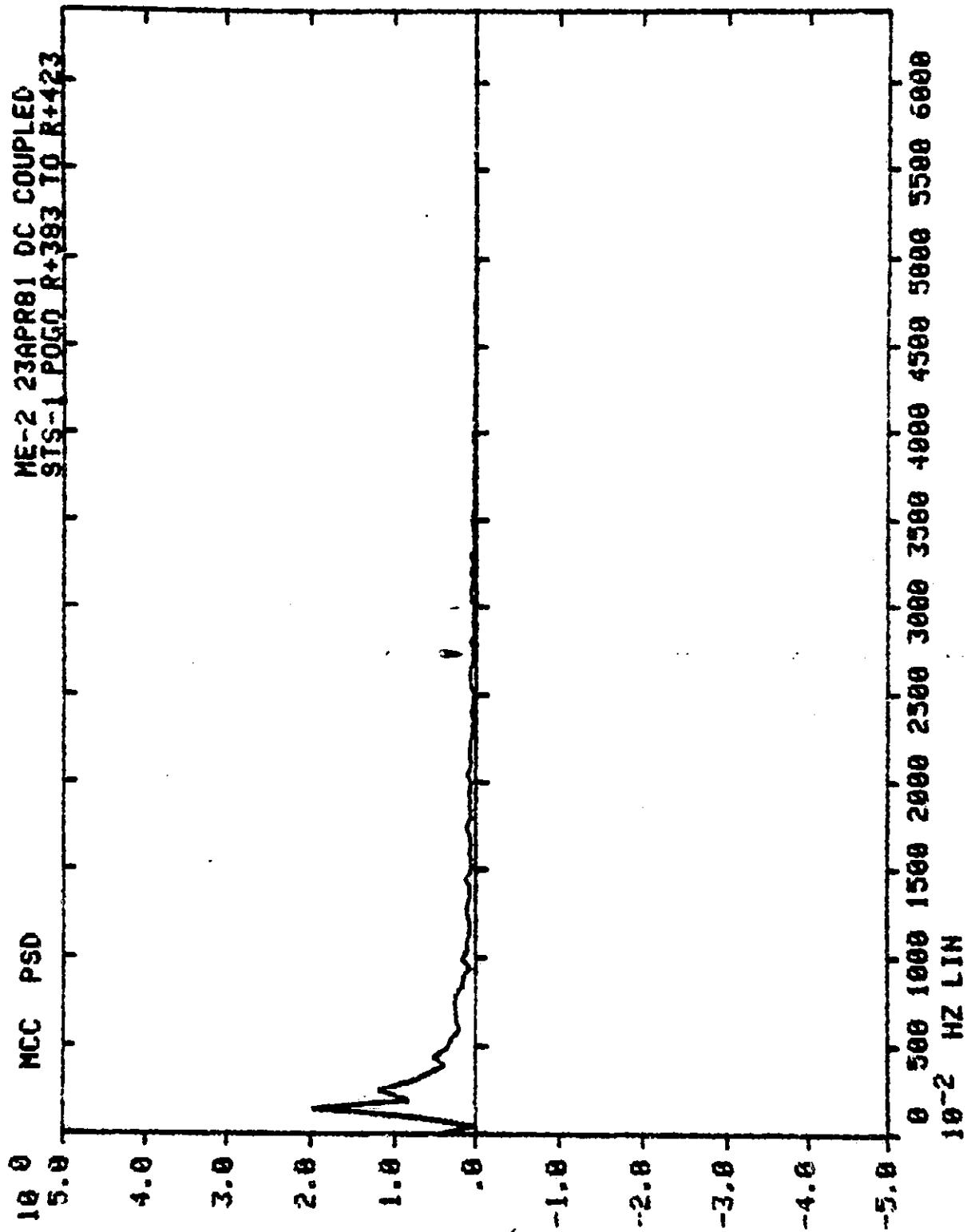
HPDP PSD

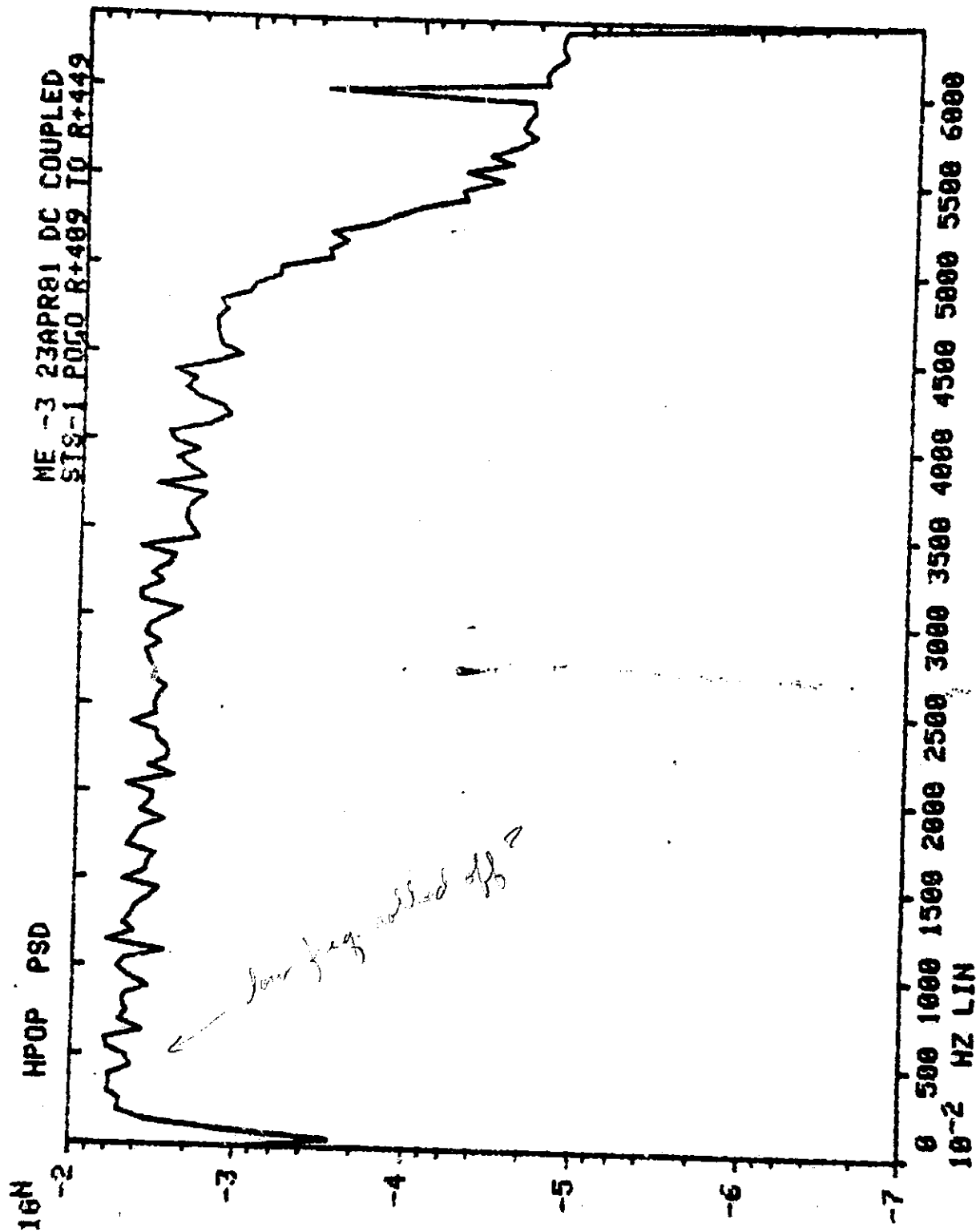
10N

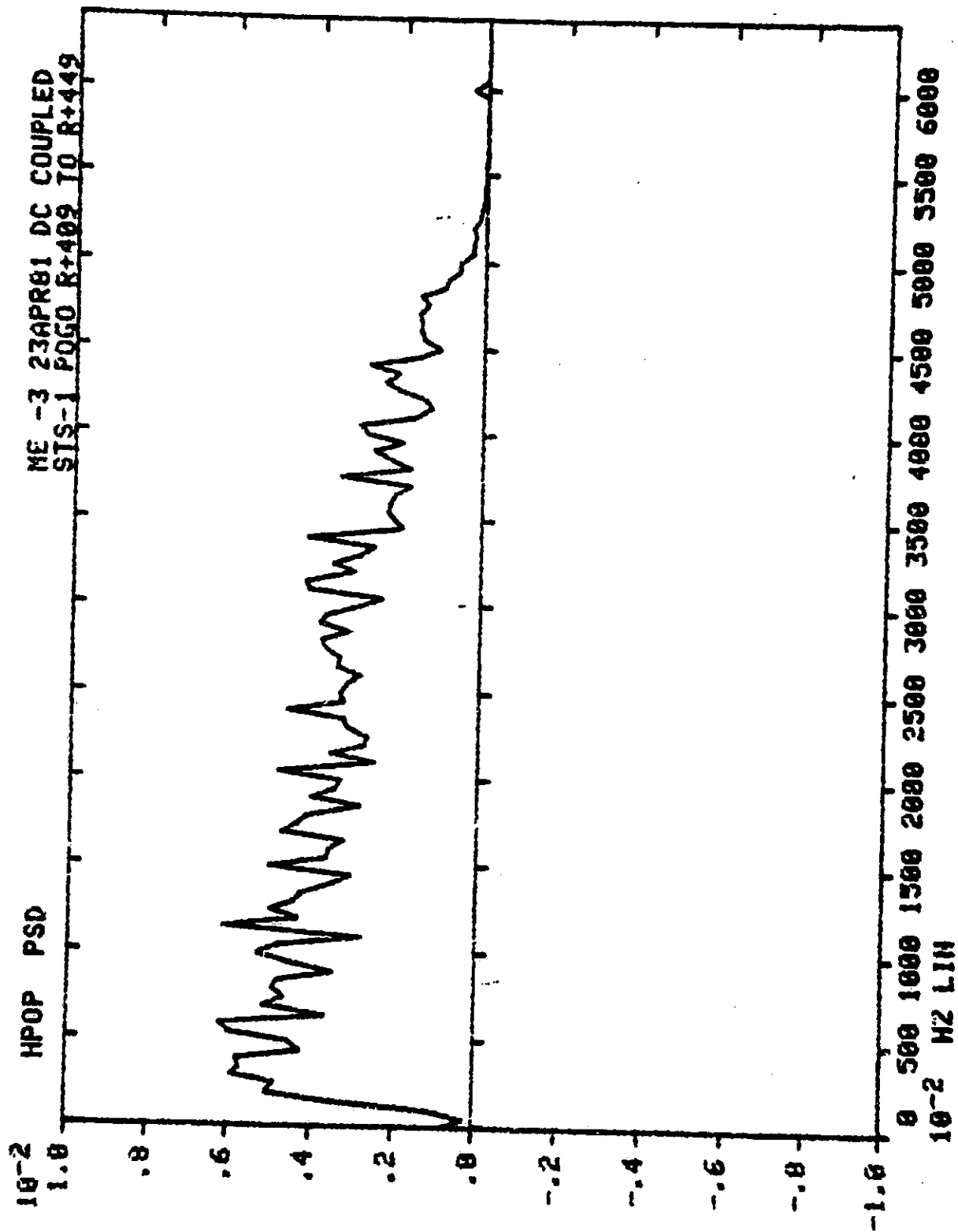








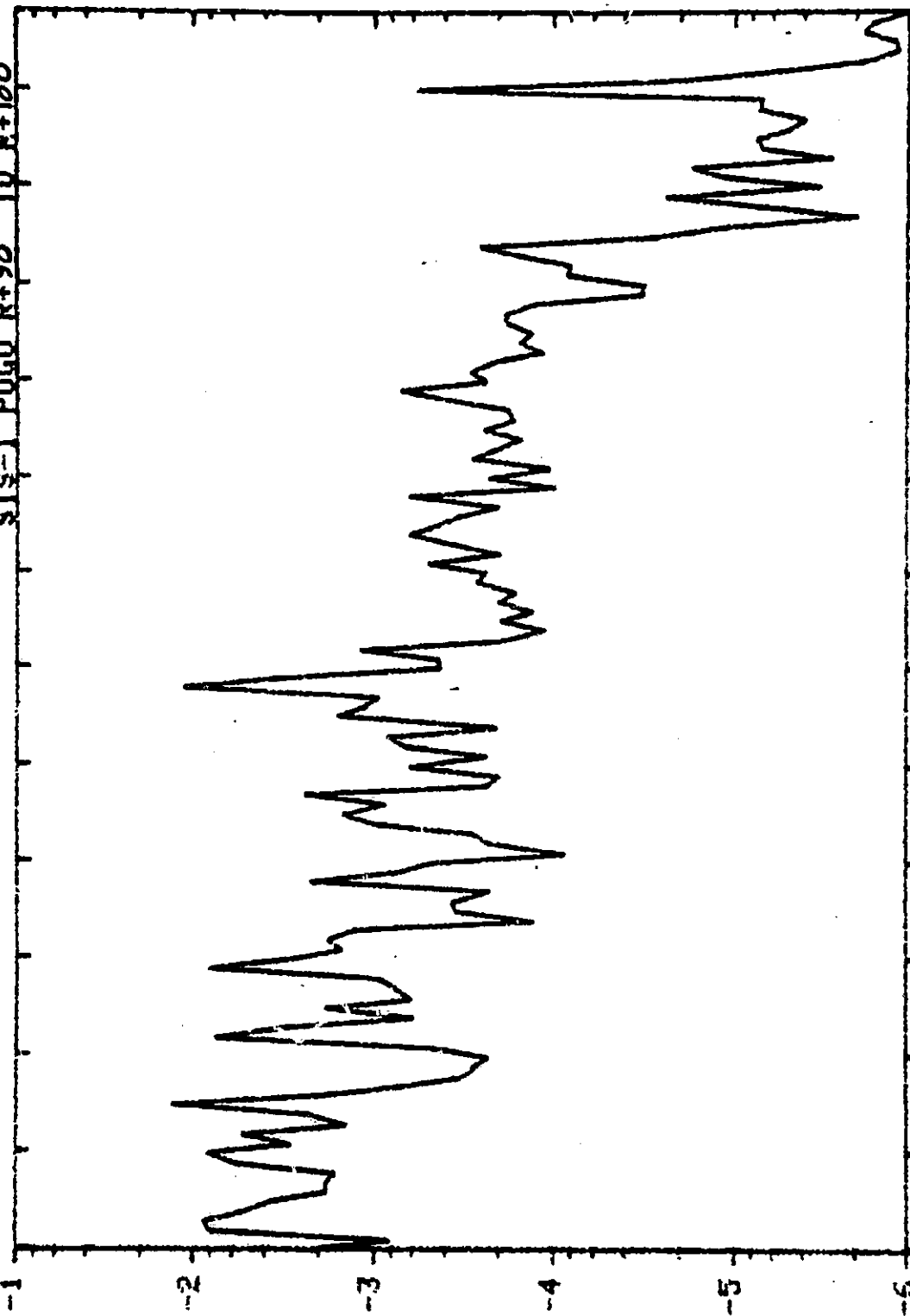




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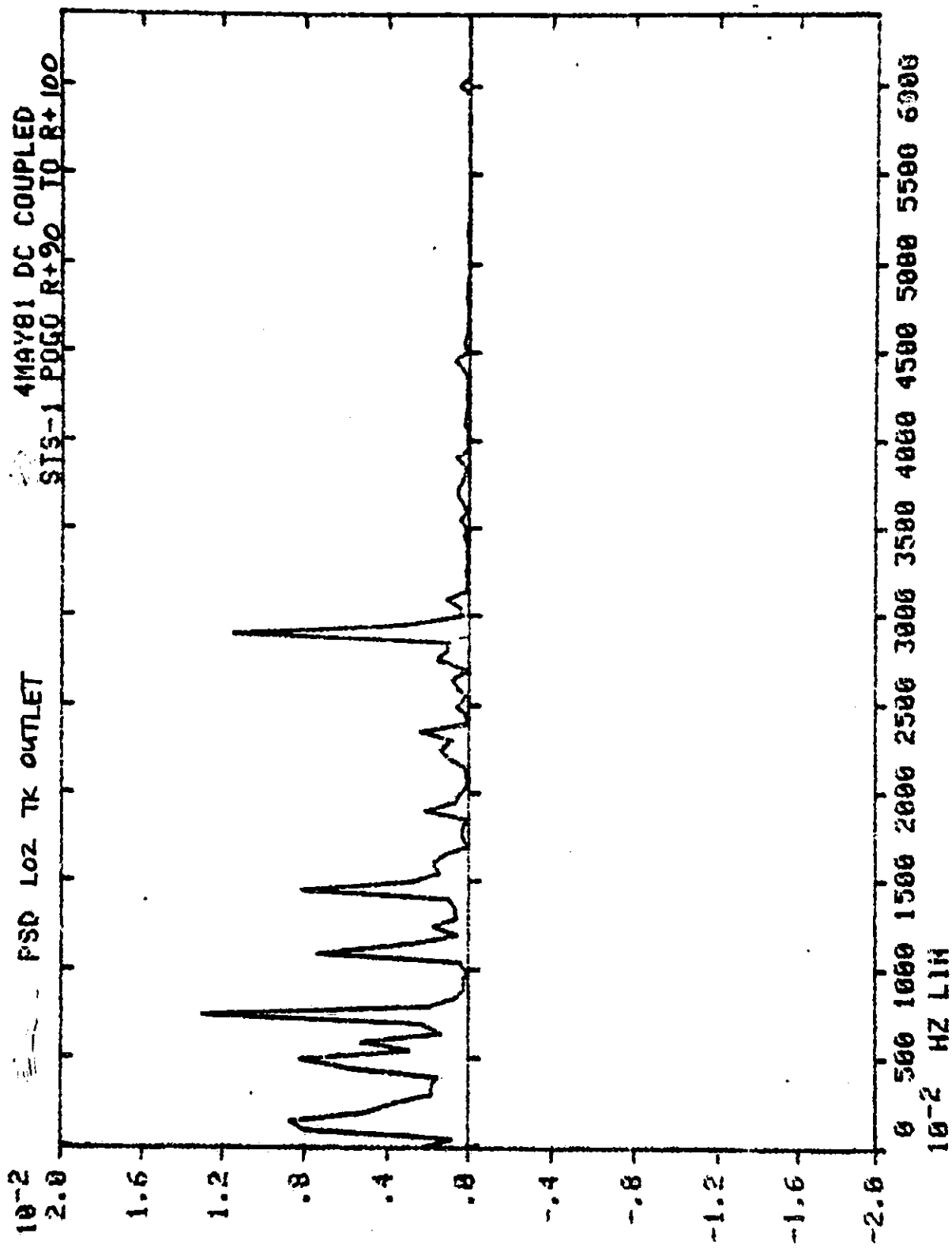
PSD LOZ TK OUTLET

4MAY81 DC COUPLED
SIS-1 POGO R+90 ID R+100



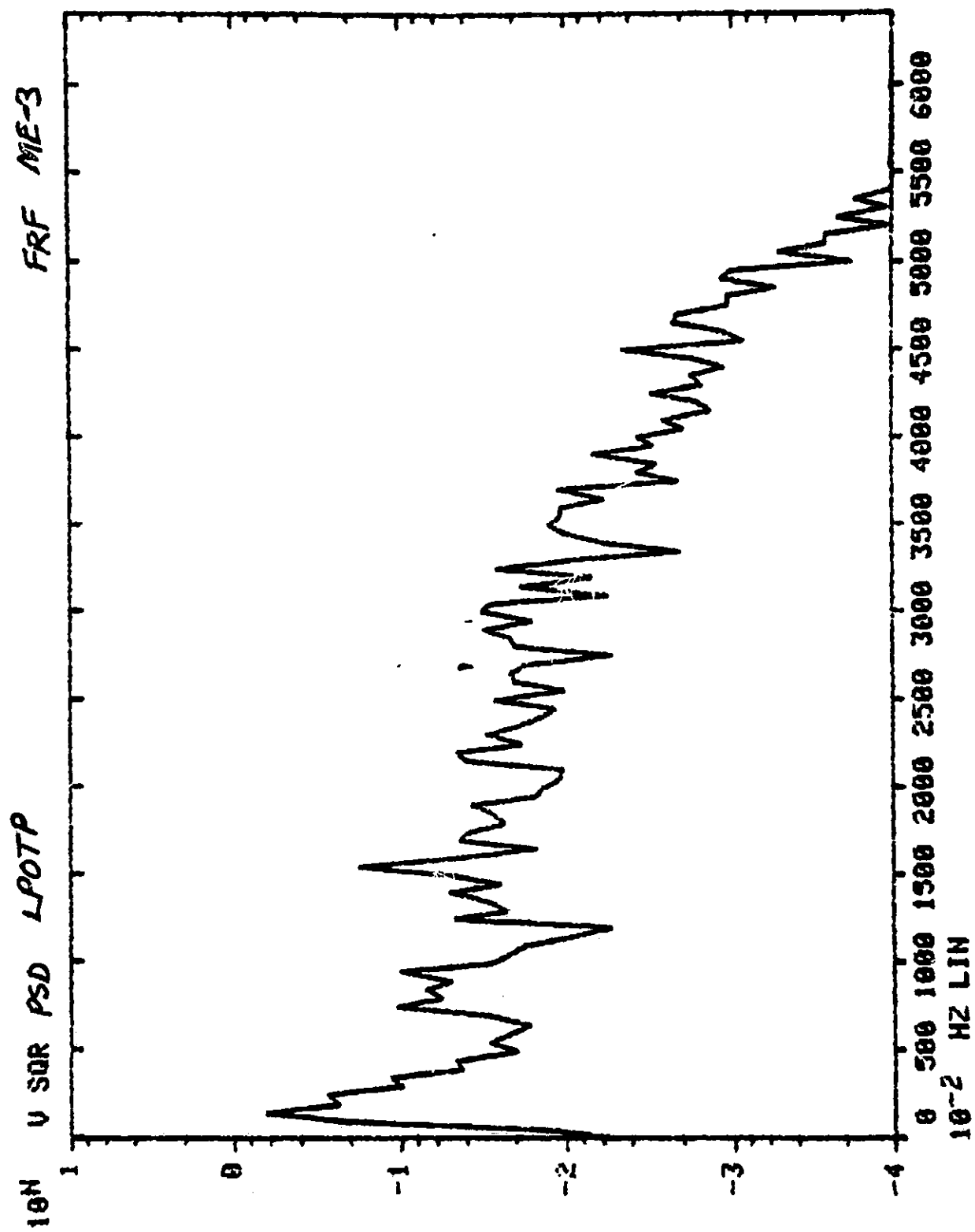
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10⁻² HZ LIN

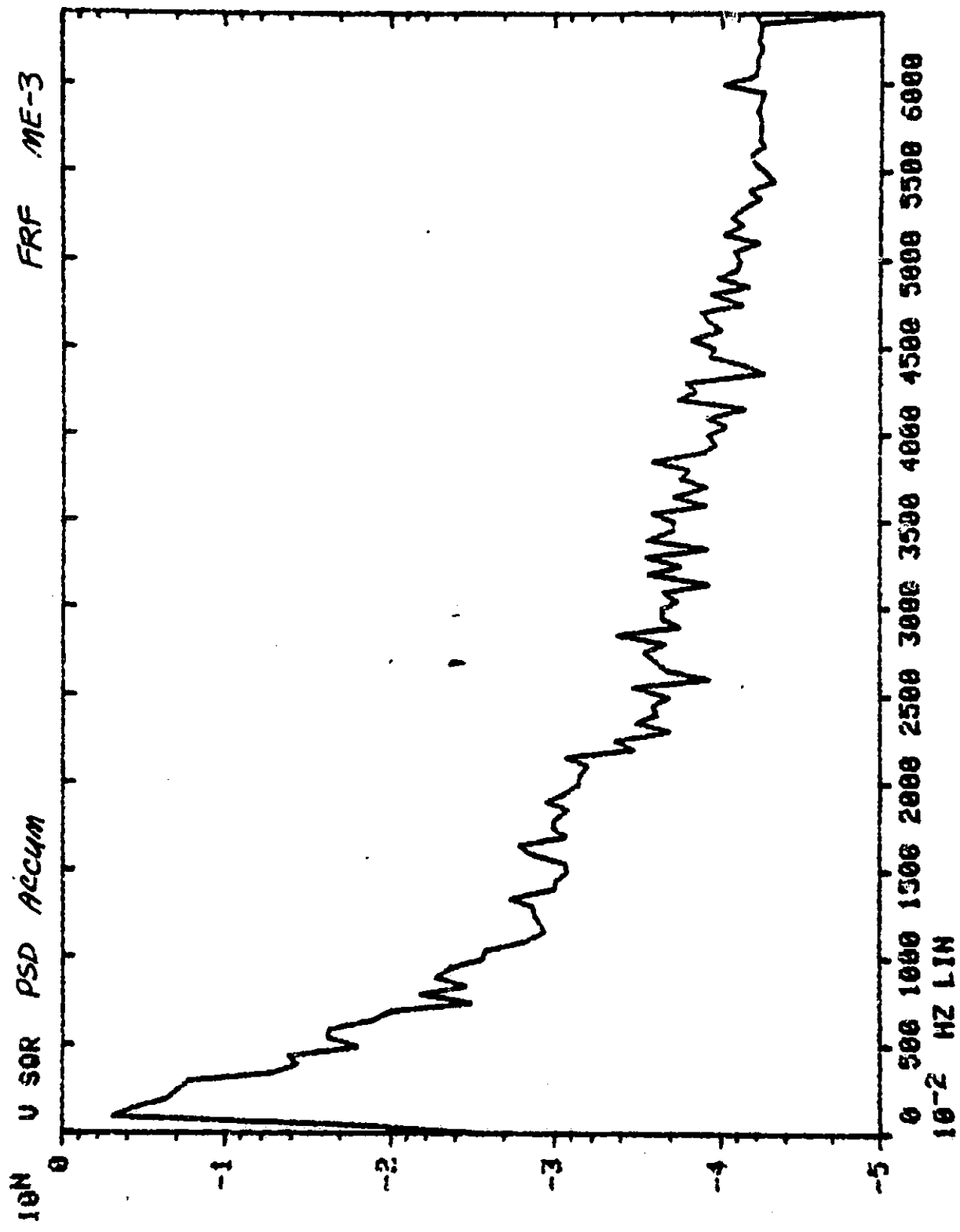


ORGANIZATION: SYSTEMS DYNAMICS LABORATORY	MARSHALL SPACE FLIGHT CENTER STS-1 POGO ANALYSIS	NAME: R. JEWELL DATE: MAY 1981
<p style="text-align: center;">TYPICAL FRF PSD ANALYSIS (PRESSURE)</p>		

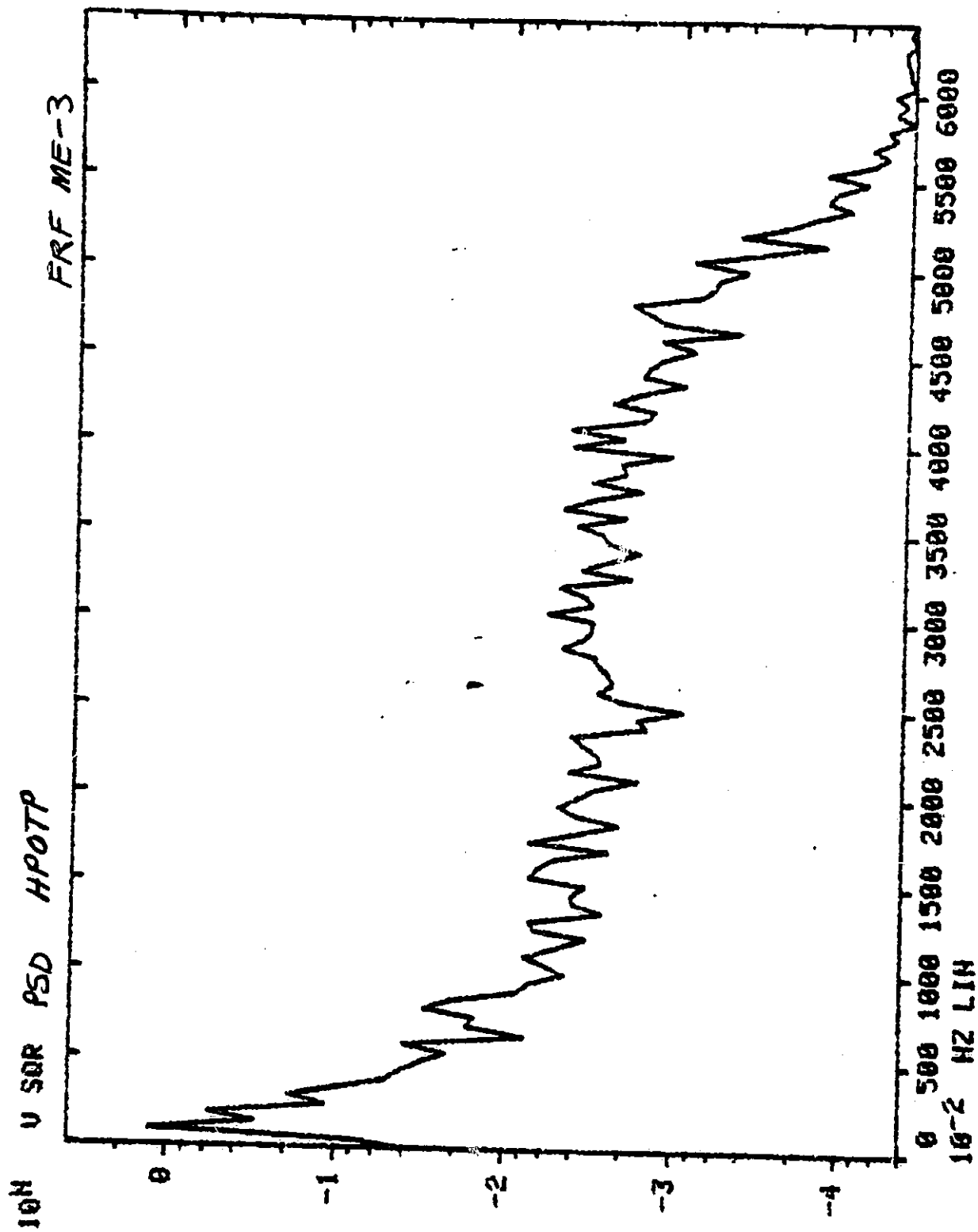
16 April 8.



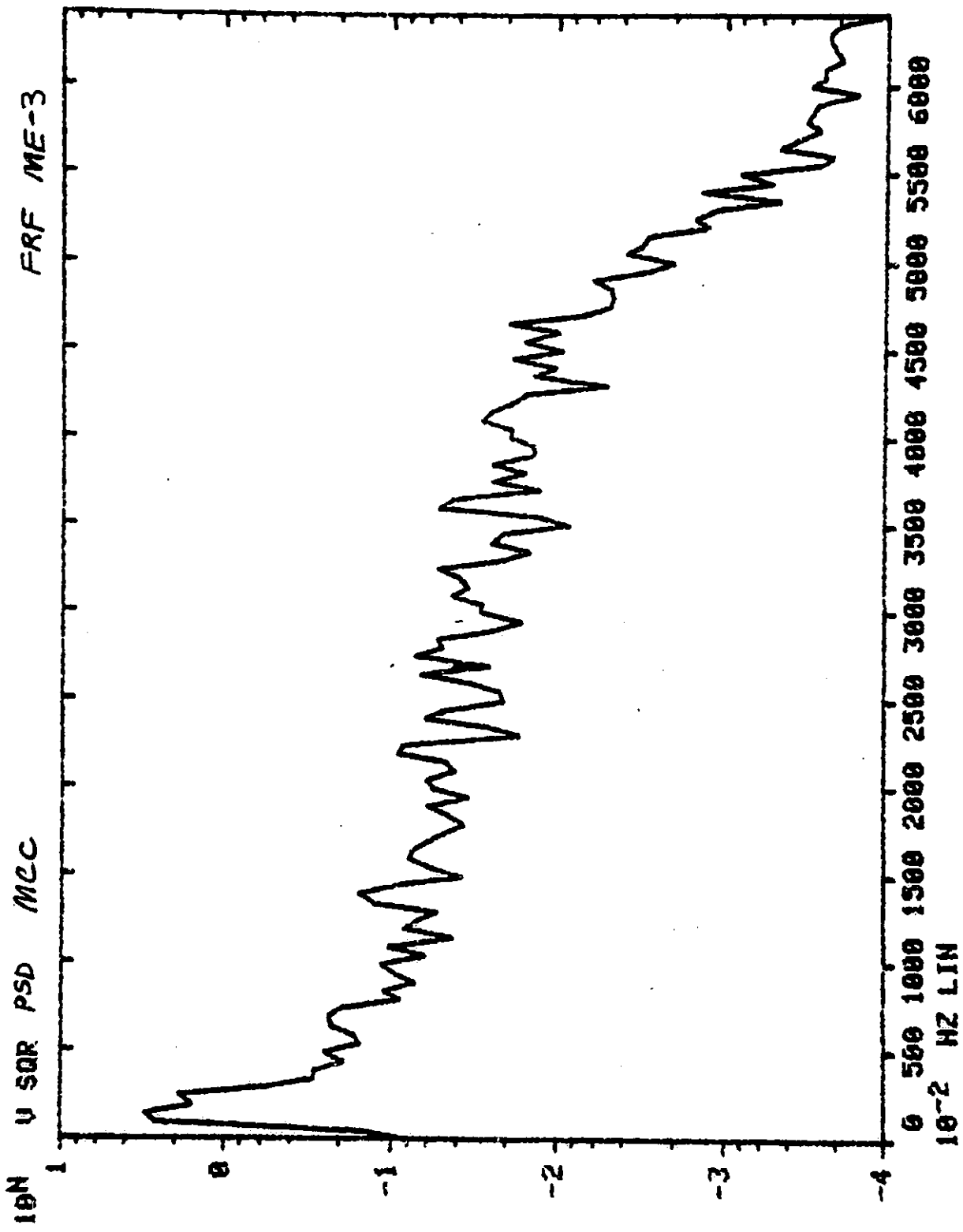
100 samples
160 Aligned S1



W. Compd
16 April 81



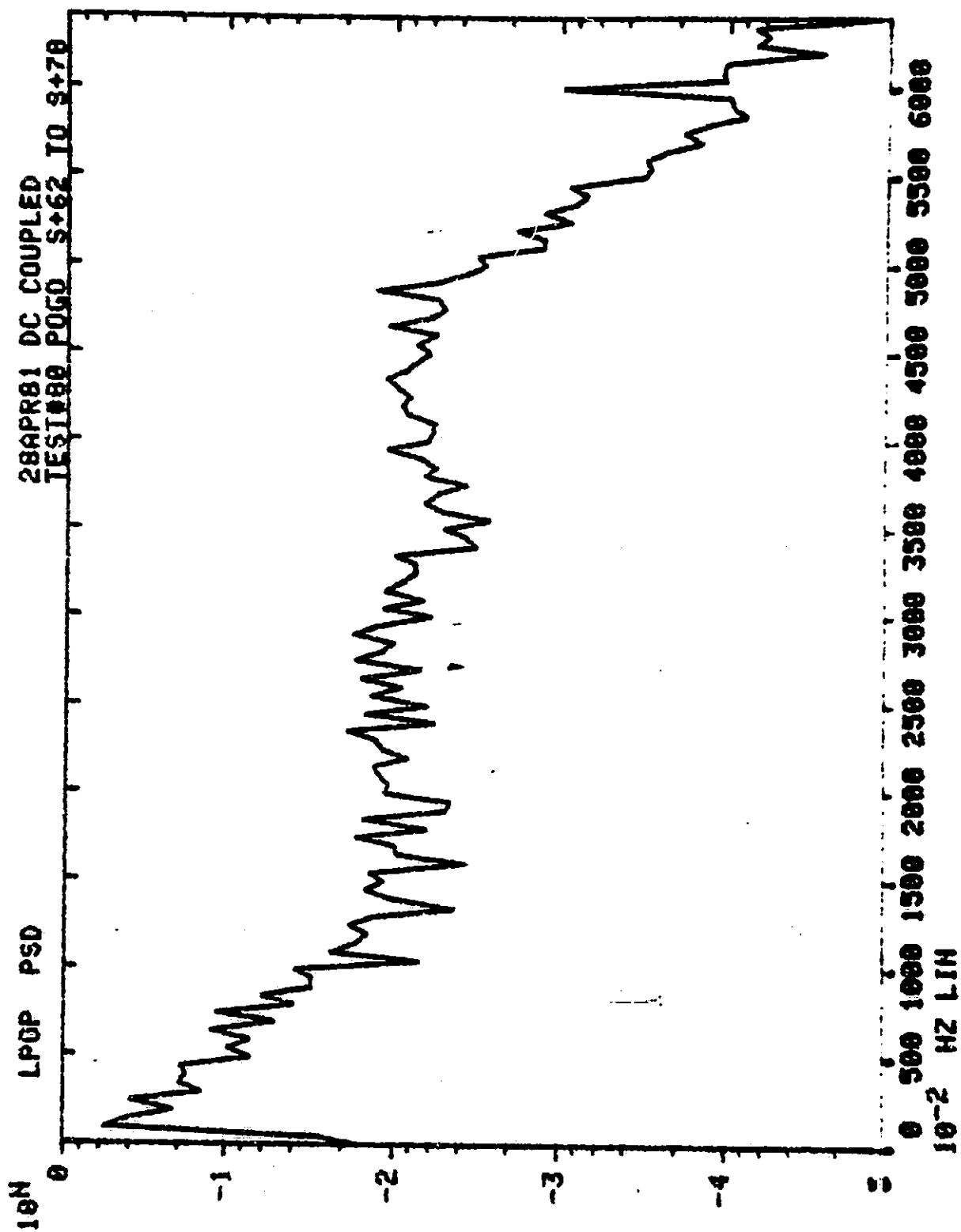
Completed
16 April 81

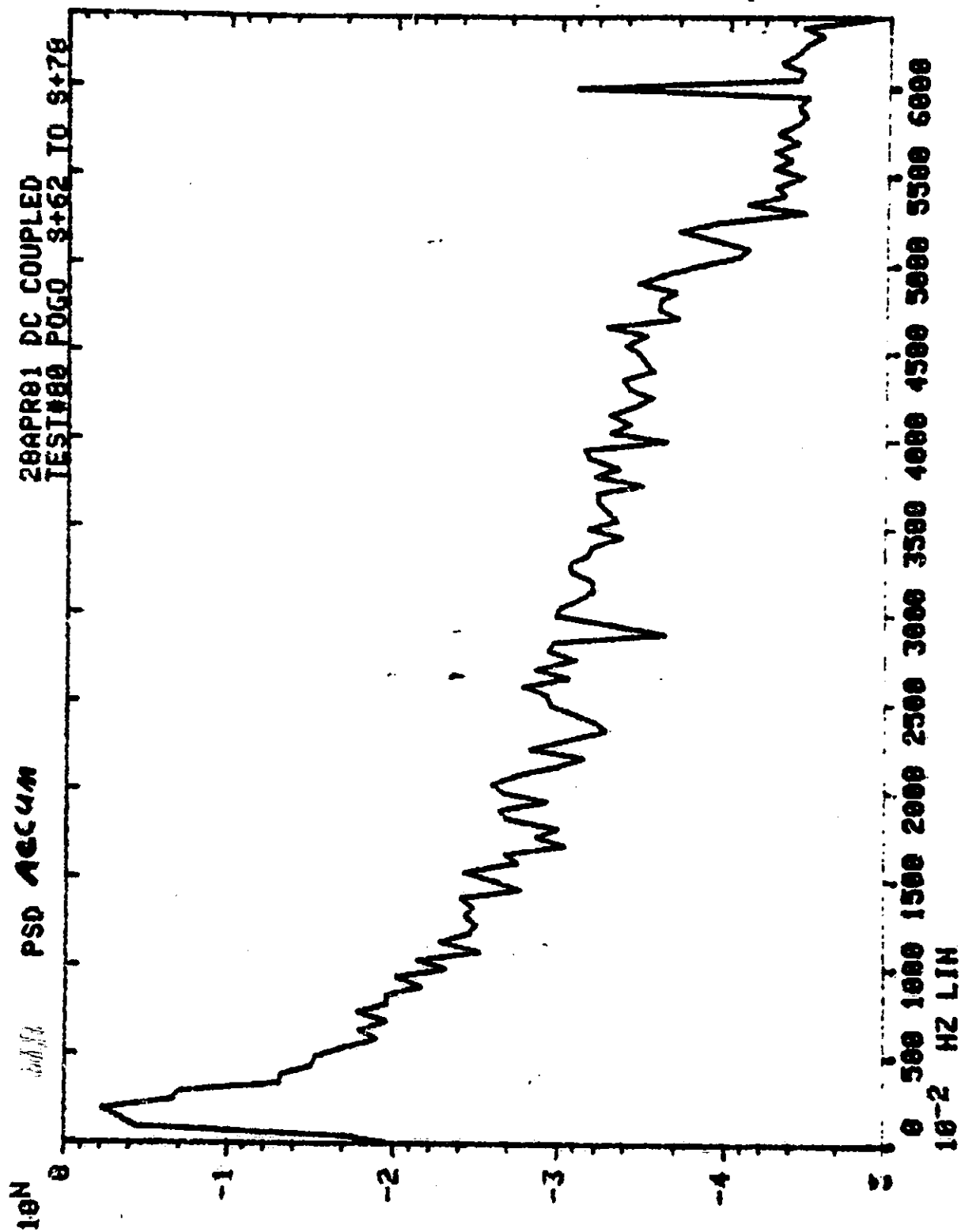


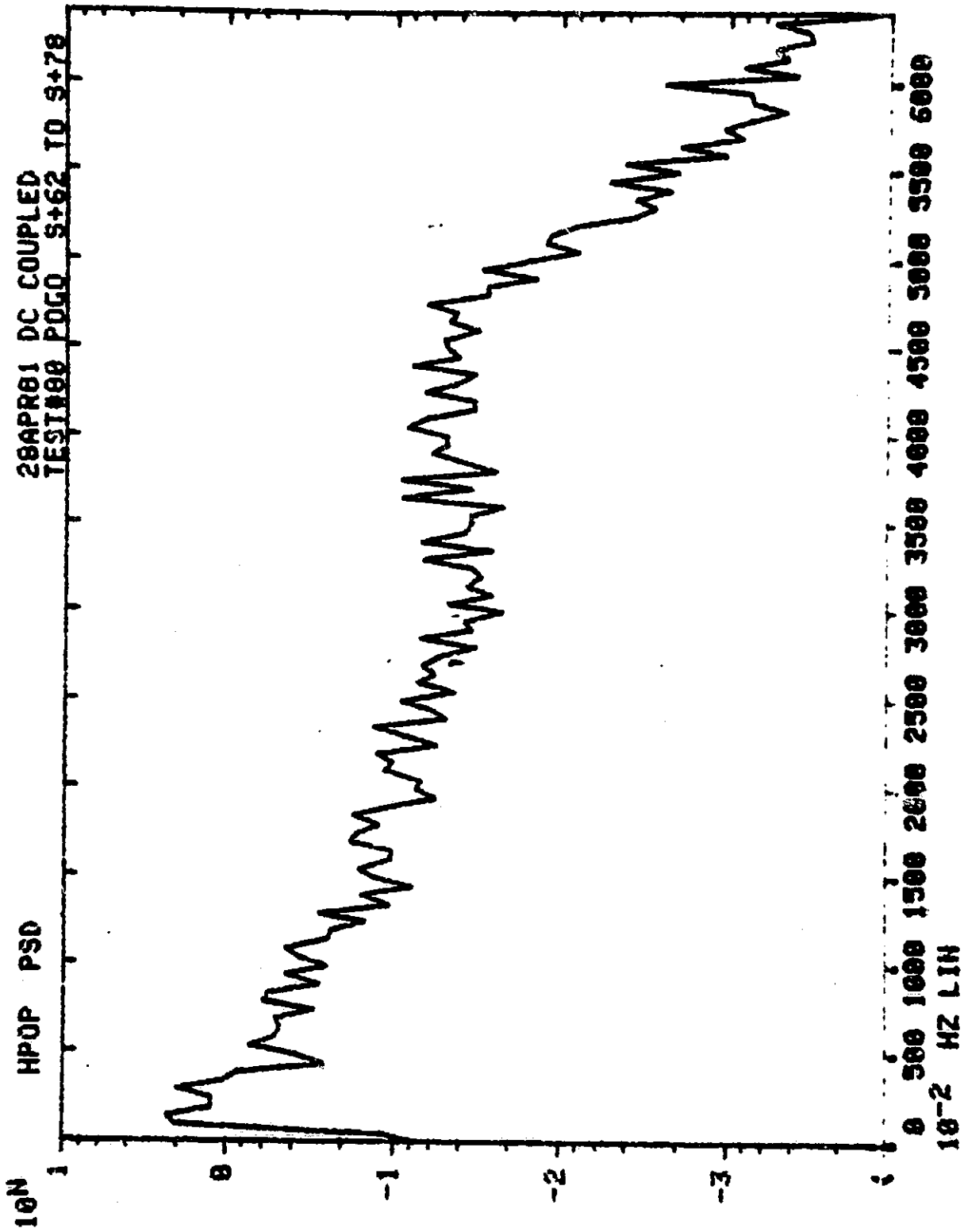
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		DATE: MAY 1981

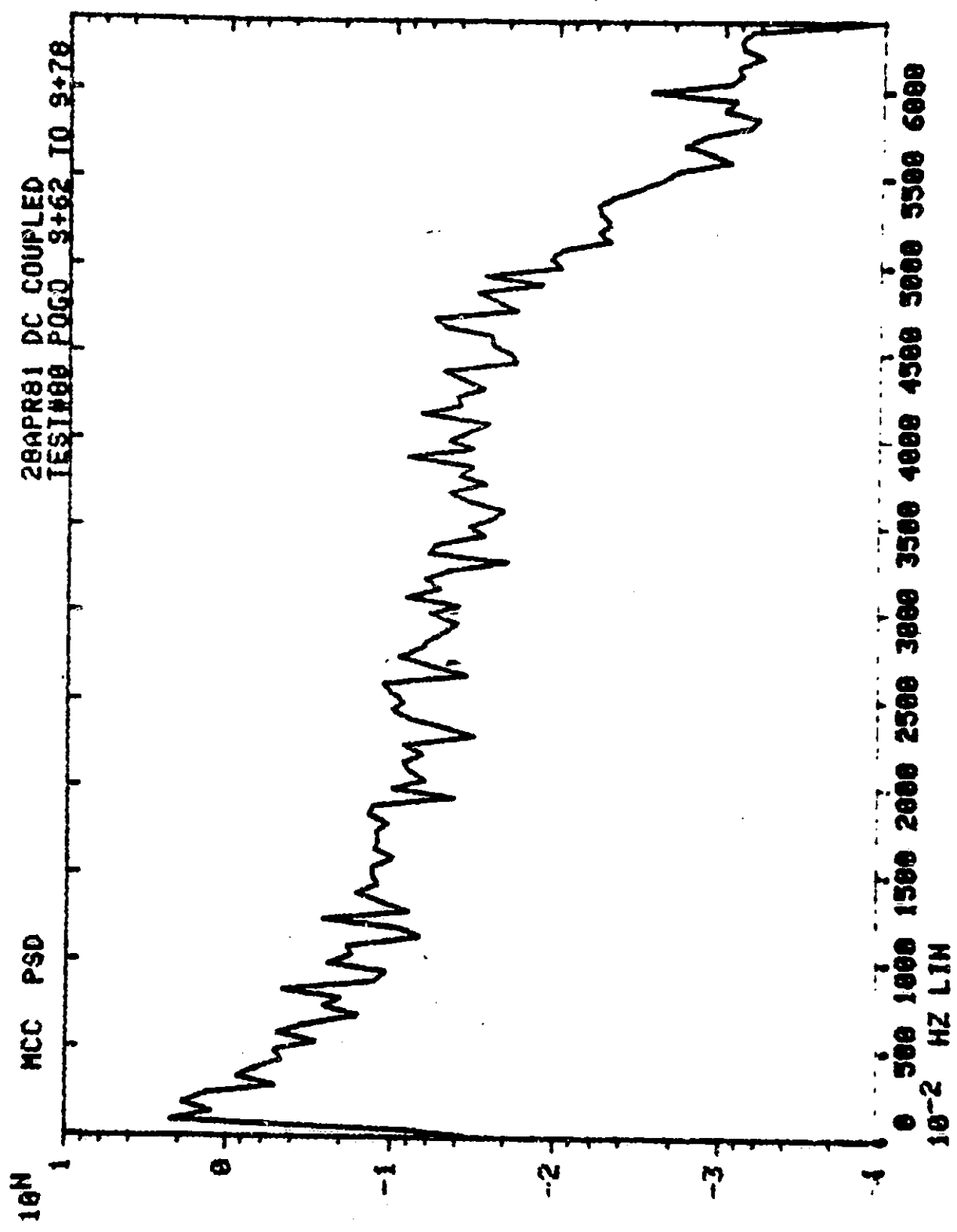
TYPICAL SINGLE ENGINE PSD ANALYSIS

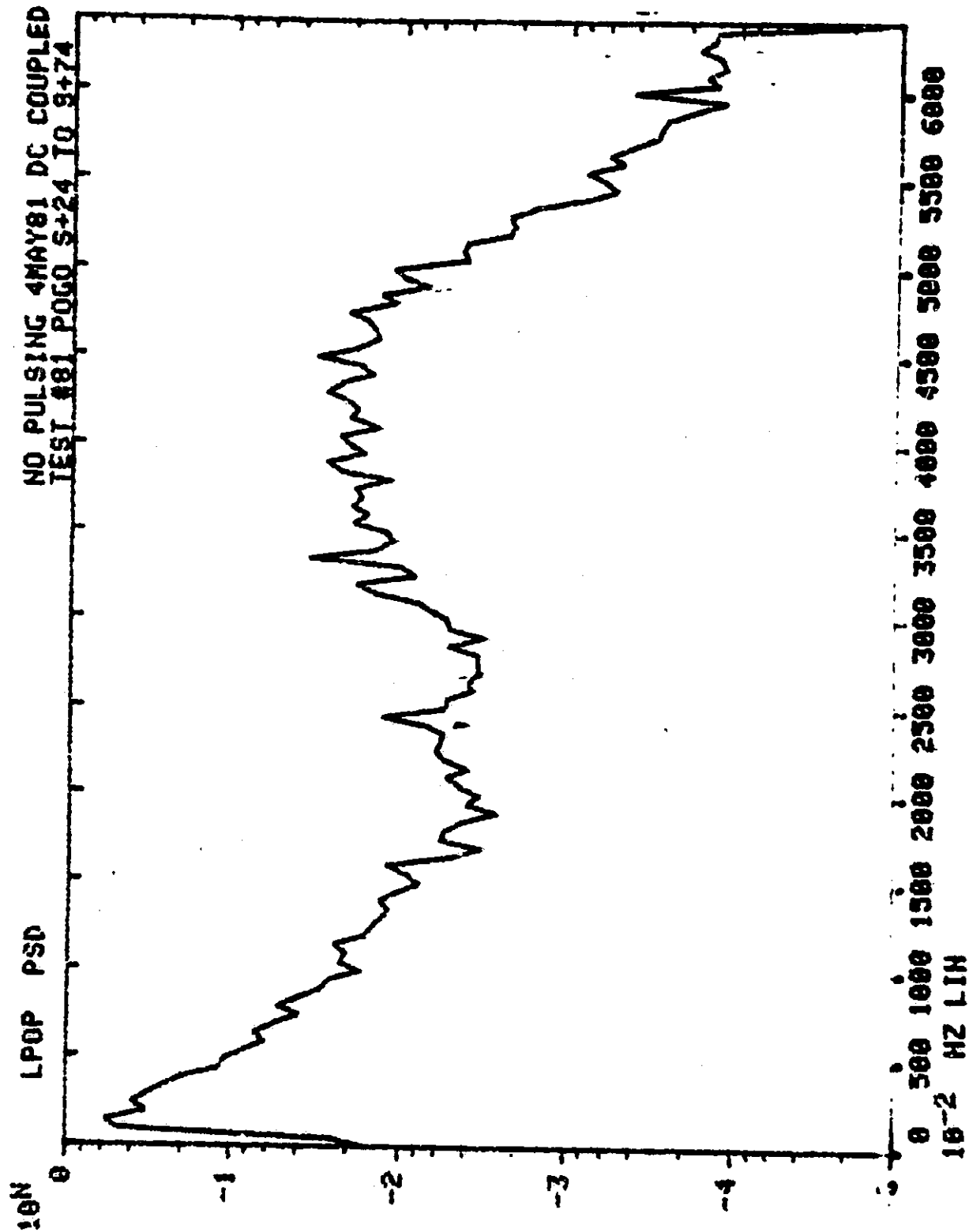
- *TEST #750-80 NPSP 80 PSI
- *TEST #750-81 NPSP 32 PSI







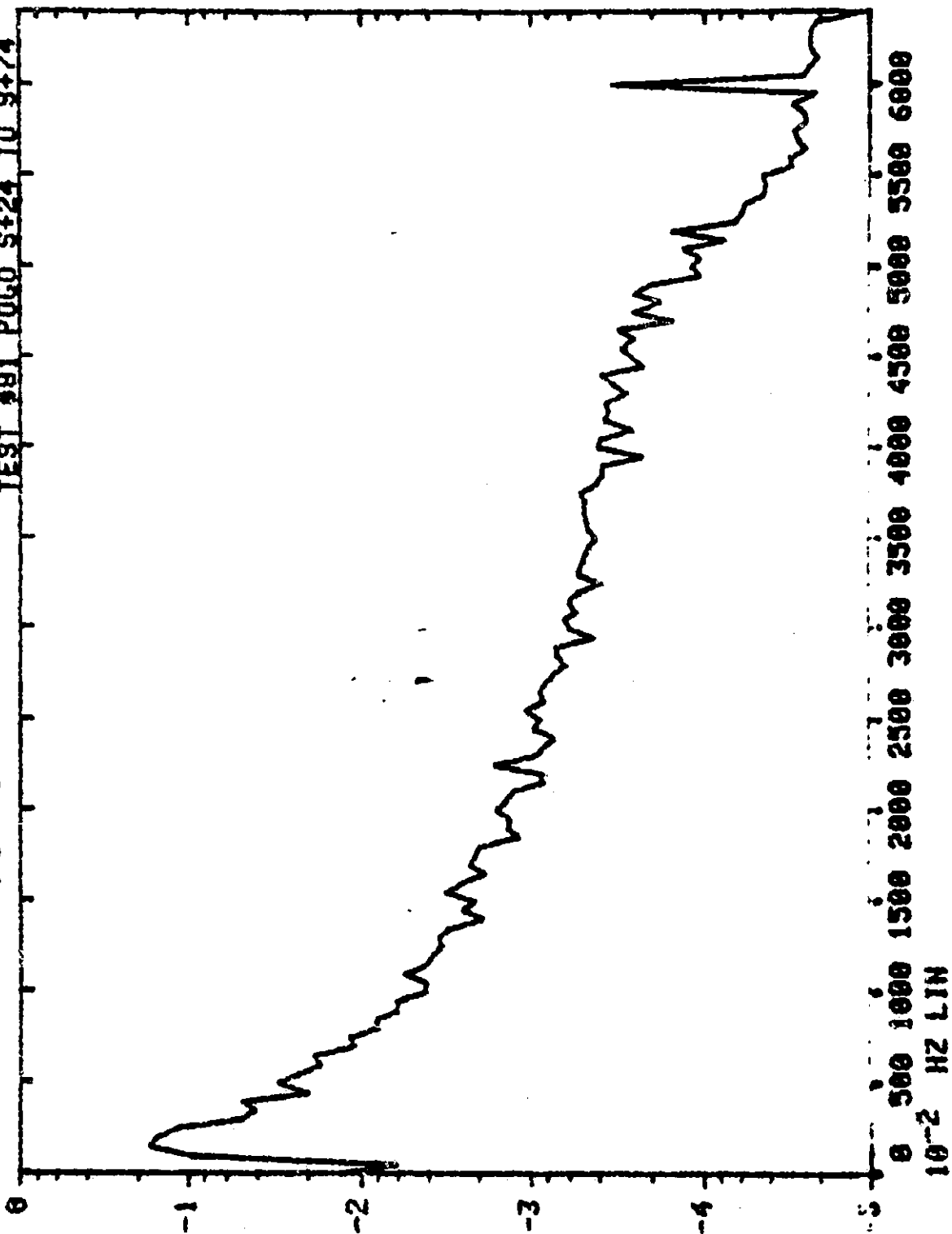


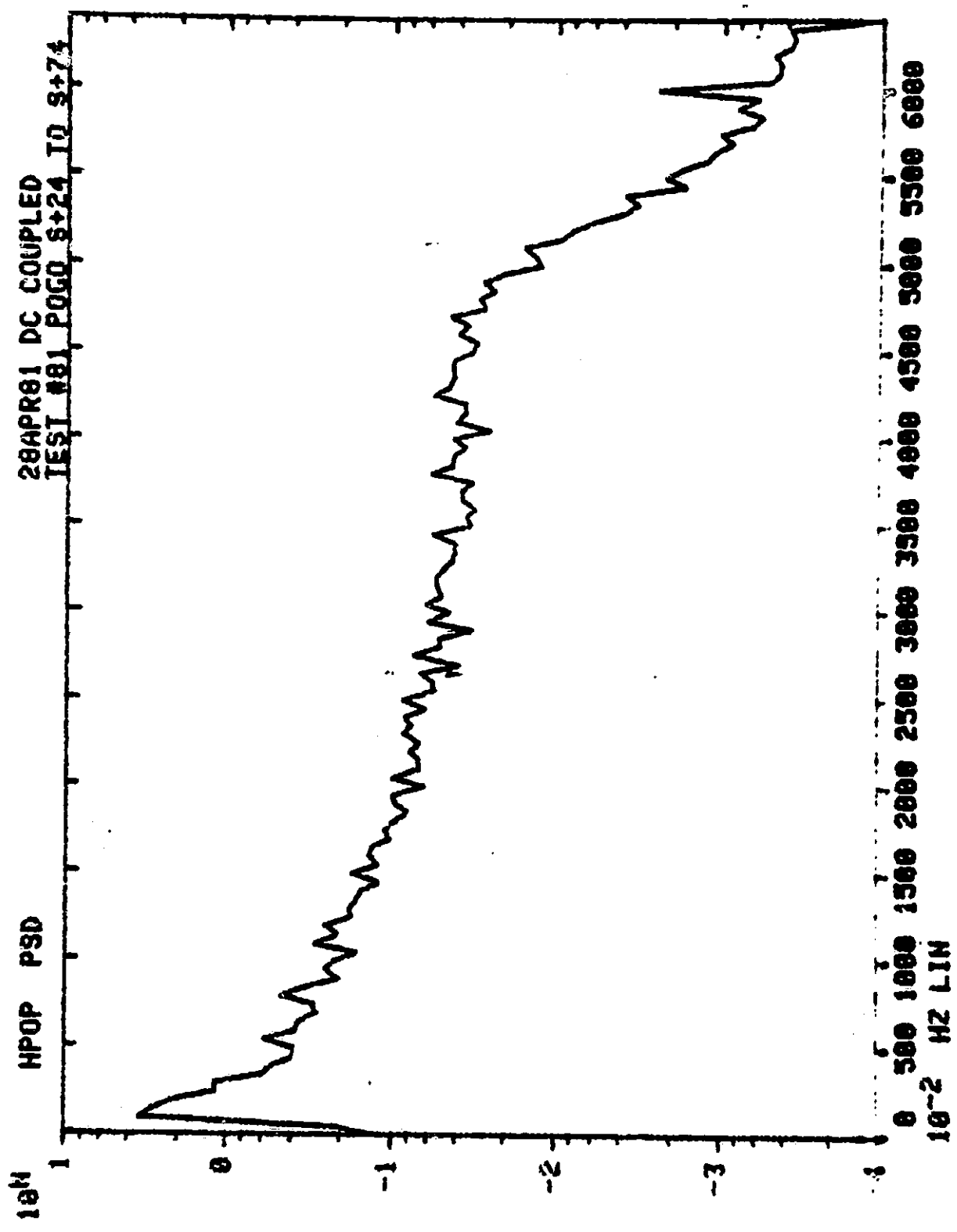


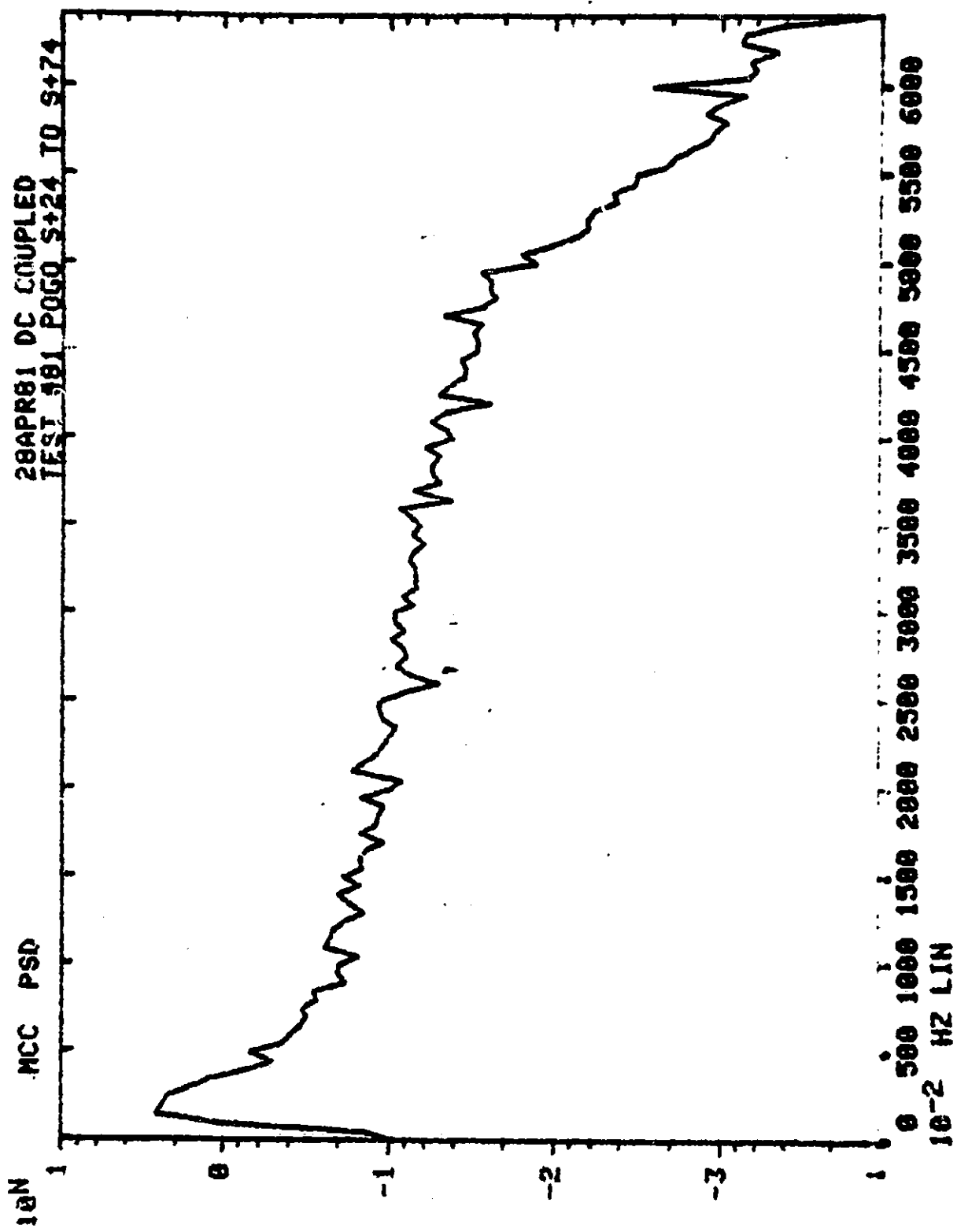
NO PULSING 4WAY81 DC COUPLED
TEST #81 POGO S+24 TO S+74

PSD ACCUM

10N







ORGANIZATION:

SYSTEMS DYNAMICS
LABORATORY

MARSHALL SPACE FLIGHT CENTER

NAME:

R. JEWELL

DATE:

MAY 1981

COMPARISON OF STS-1 PRESSURE DATA
WITH FRF AND SINGLE ENGINE

STS-1 POGO ANALYSIS

MAX RMS VALUES IN 2-5 Hz RANGE FROM POGO FED'S

ENGINE	EVENT	DATA RED. PERIOD	MEASUREMENT			
			LPOTP psi	ACCUM psi	HPOTP psi	MCC psi
ME-1	STS-1	Before max Q	1.808 ^①	0.387	BAD	1.019
		Max Q	1.840 ^①	0.397	BAD	0.838
		Before SRB sep.	1.454 ^①	0.407	BAD	1.217
		After SRB sep.	1.414 ^①	0.381	BAD	0.949
		Before MECO	1.225 ^①	0.302	BAD	0.894
	FRF	100% PUL	3.000 ^①	BAD	BAD	1.075
	STS-1	Before max Q	0.496	2.019 ^②	0.485	0.903
		Max Q	0.434	1.687 ^②	0.340	0.620
		Before SRB sep.	0.430	1.481 ^②	0.367	0.981
		After SRB sep.	BAD	1.378 ^②	0.391	0.894
		Before MECO	0.332	BAD	0.374	0.930
ME-2	FRF	100% PUL	0.600	2.449 ^②	1.581	1.414
	STS-1	Before max Q	0.409	BAD	0.044 ^③	1.414
		Max Q	0.321	BAD	0.029 ^③	0.877
		Before SRB sep.	0.496	BAD	0.016 ^③	1.271
		After SRB sep.	0.453	BAD	0.049 ^③	0.954
		Before MECO	0.374	BAD	0.054 ^③	1.140
	FRF	100% PUL	0.570	0.700	0.806	1.285
	TEST #50	Before pulsing	0.539	0.539	1.072	1.049
		Before pulsing	0.539	0.293	1.285	1.162
	TEST #31	Before pulsing	0.539	0.293	1.285	1.162
	SINGLE	Before pulsing	0.539	0.539	1.072	1.049
		Before pulsing	0.539	0.293	1.285	1.162

① GAIN IN DATA

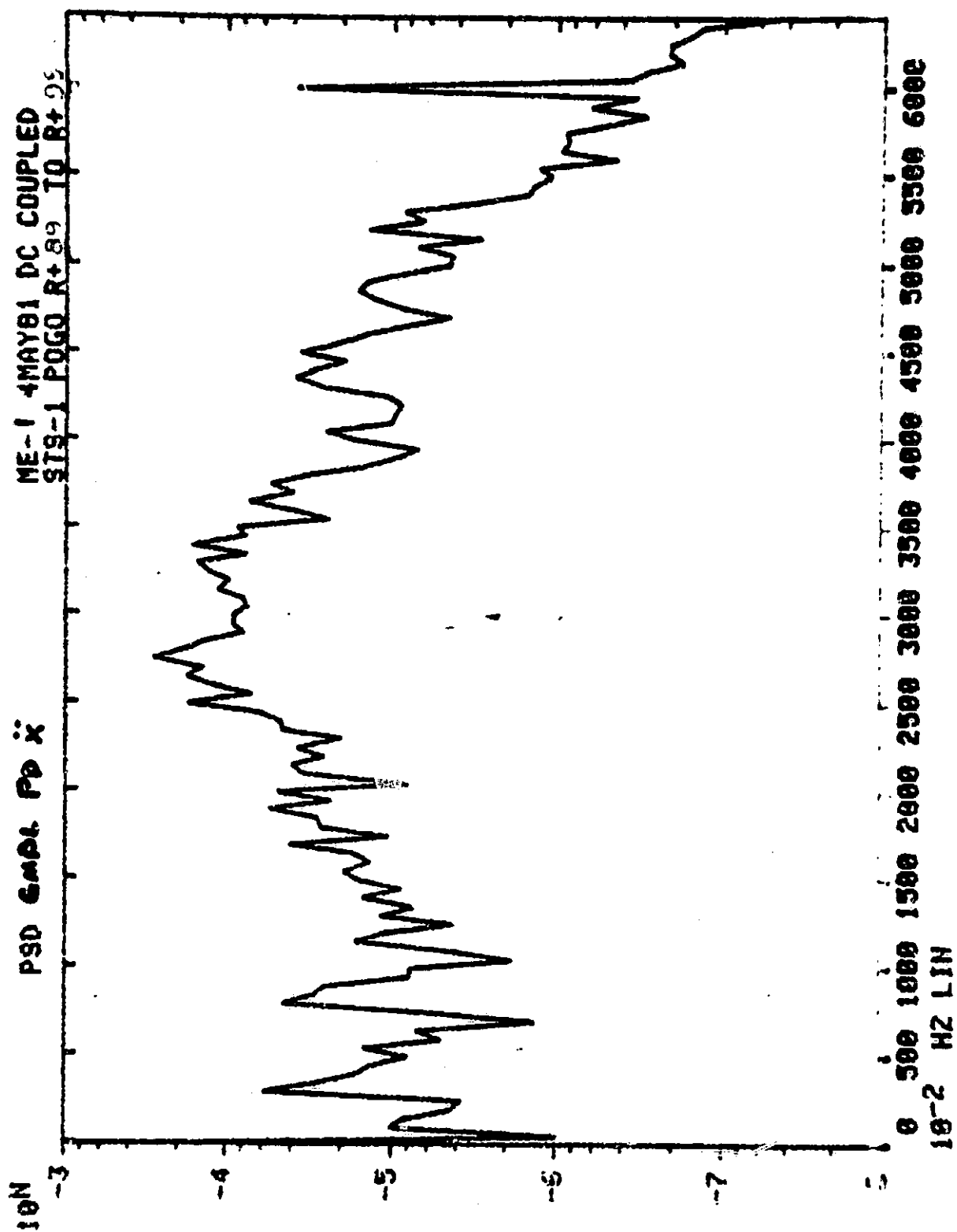
② GAIN IN DATA?

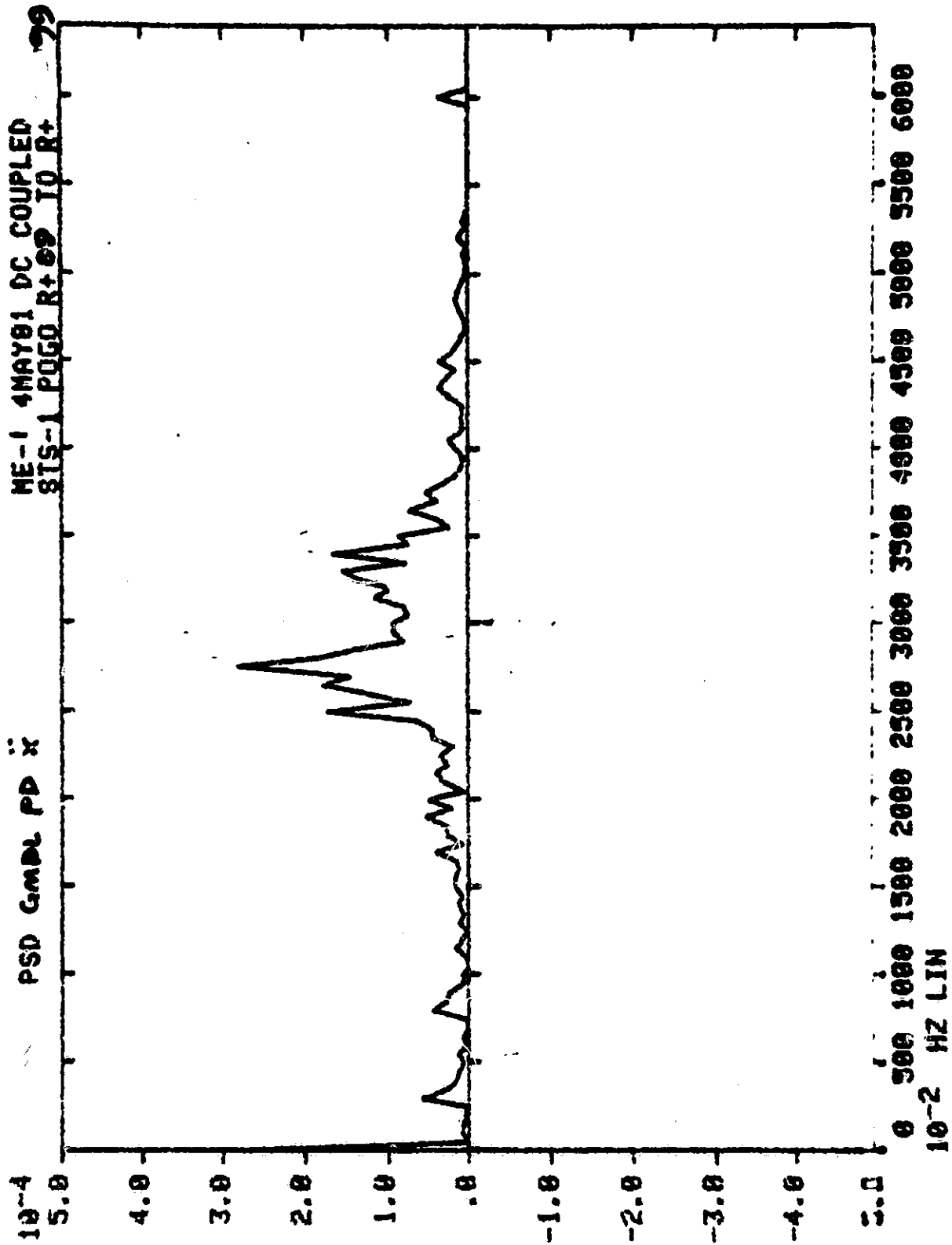
③ LOW FREQUENCY LEVELS ARE DOWN

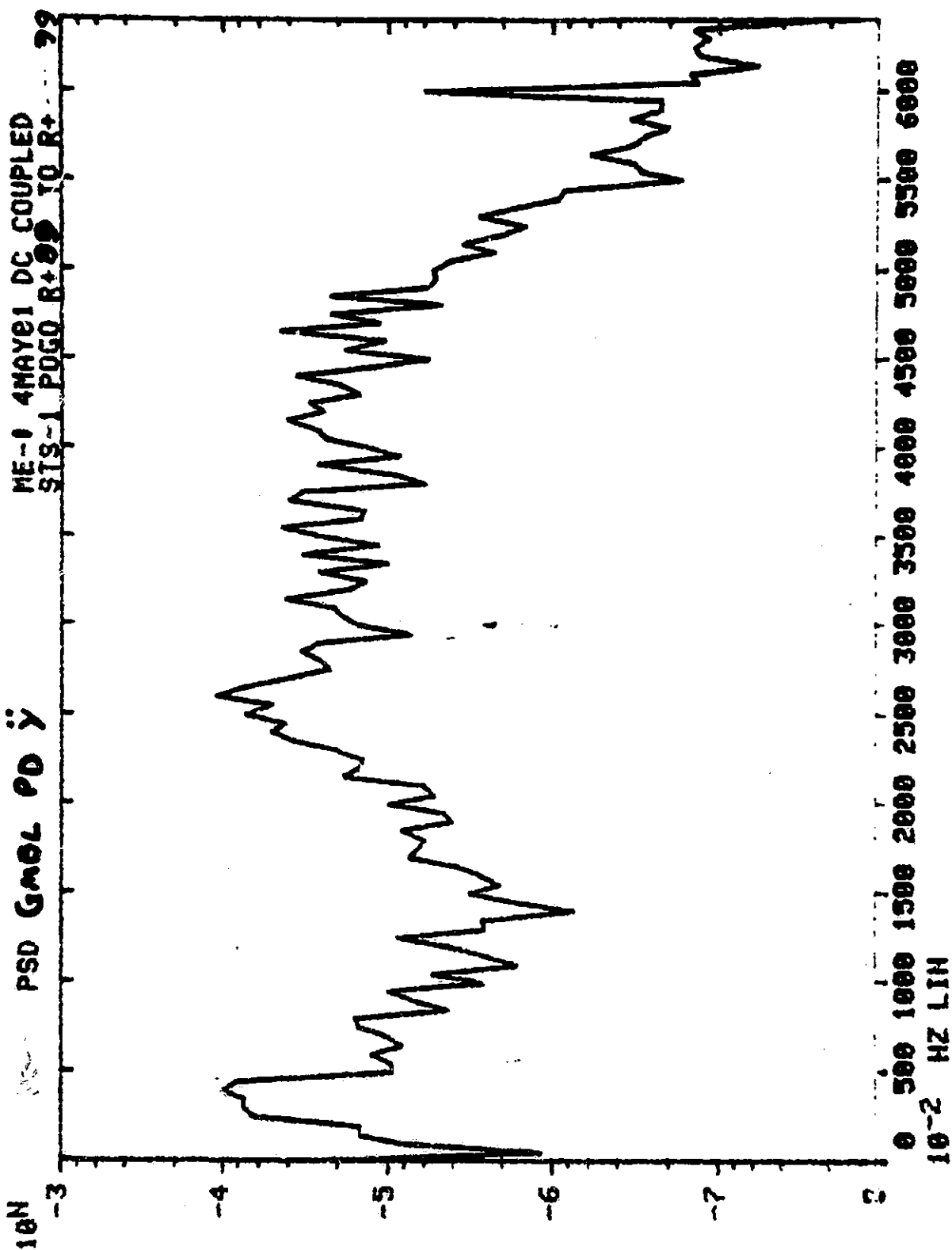
ORGANIZATION: SYSTEMS DYNAMICS LABORATORY	MARSHALL SPACE FLIGHT CENTER STS-1 POGO ANALYSIS	NAME: R. JEWELL
		DATE: MAY 1981

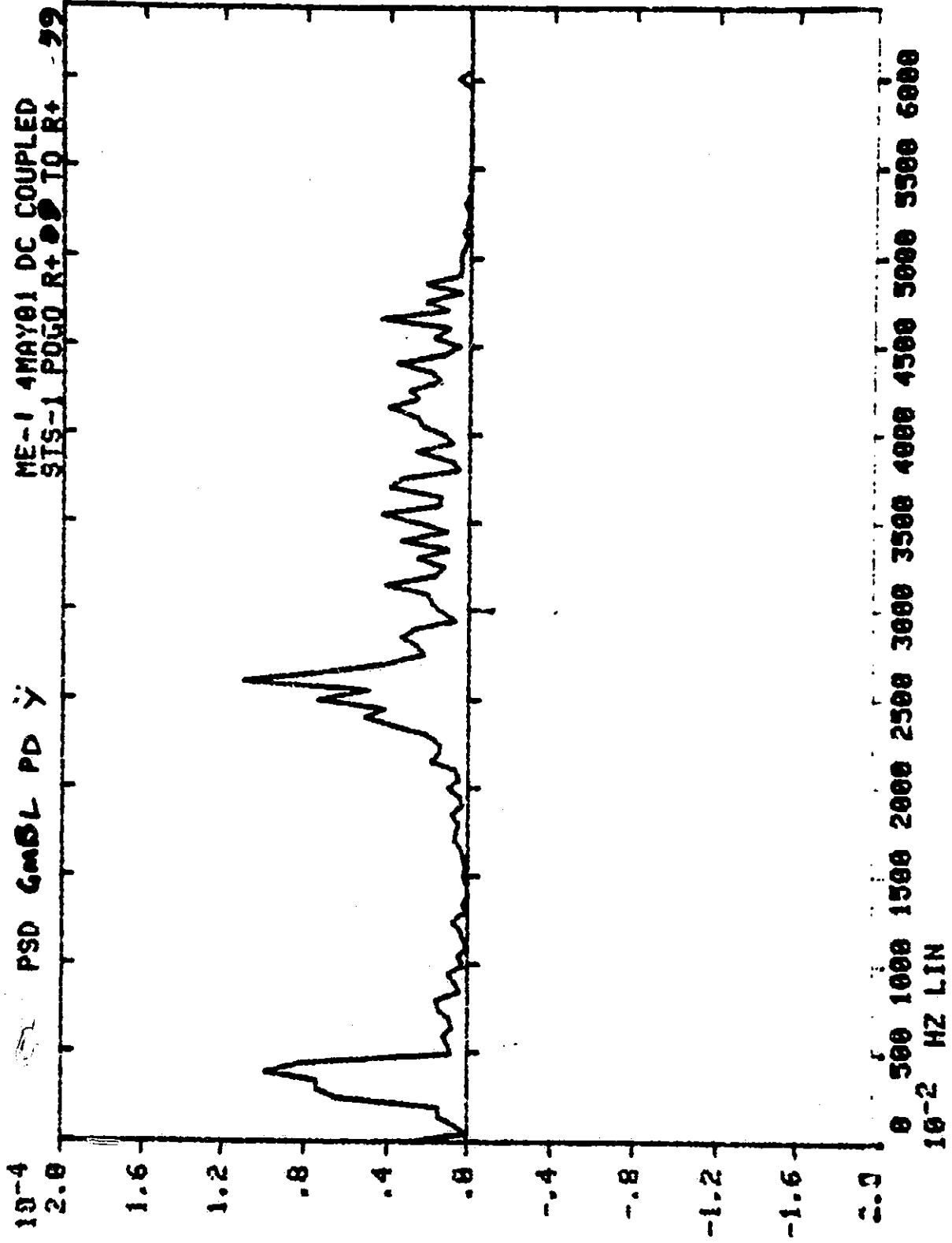
TYPICAL STS-1 PSD ANALYSIS (ACCELEROMETERS)

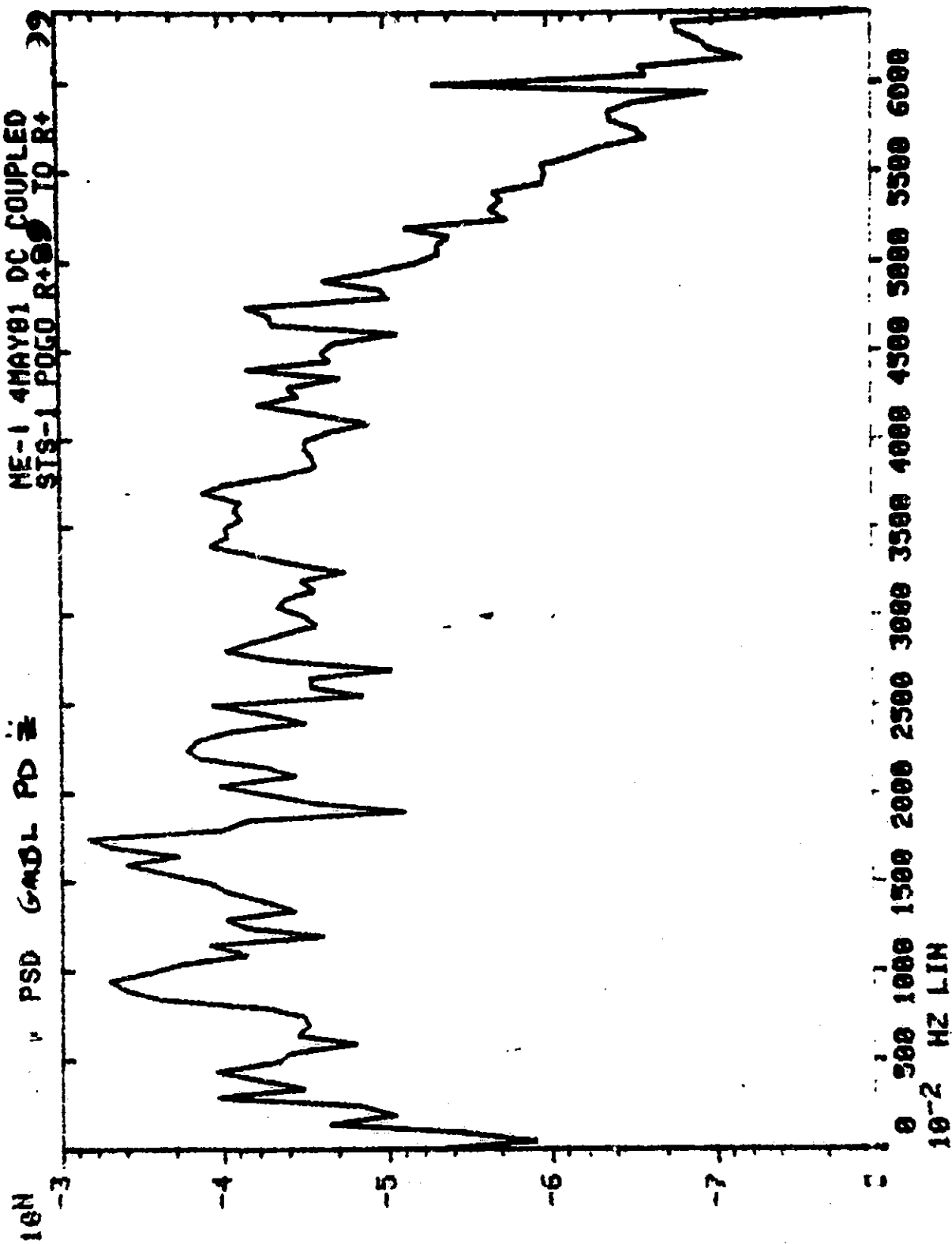
- * GIMBAL PAD X, Y, AND Z
- * LH2 TK BOTTOM X, Y, AND Z
- * LO2 TK BOTTOM X, Y, AND Z

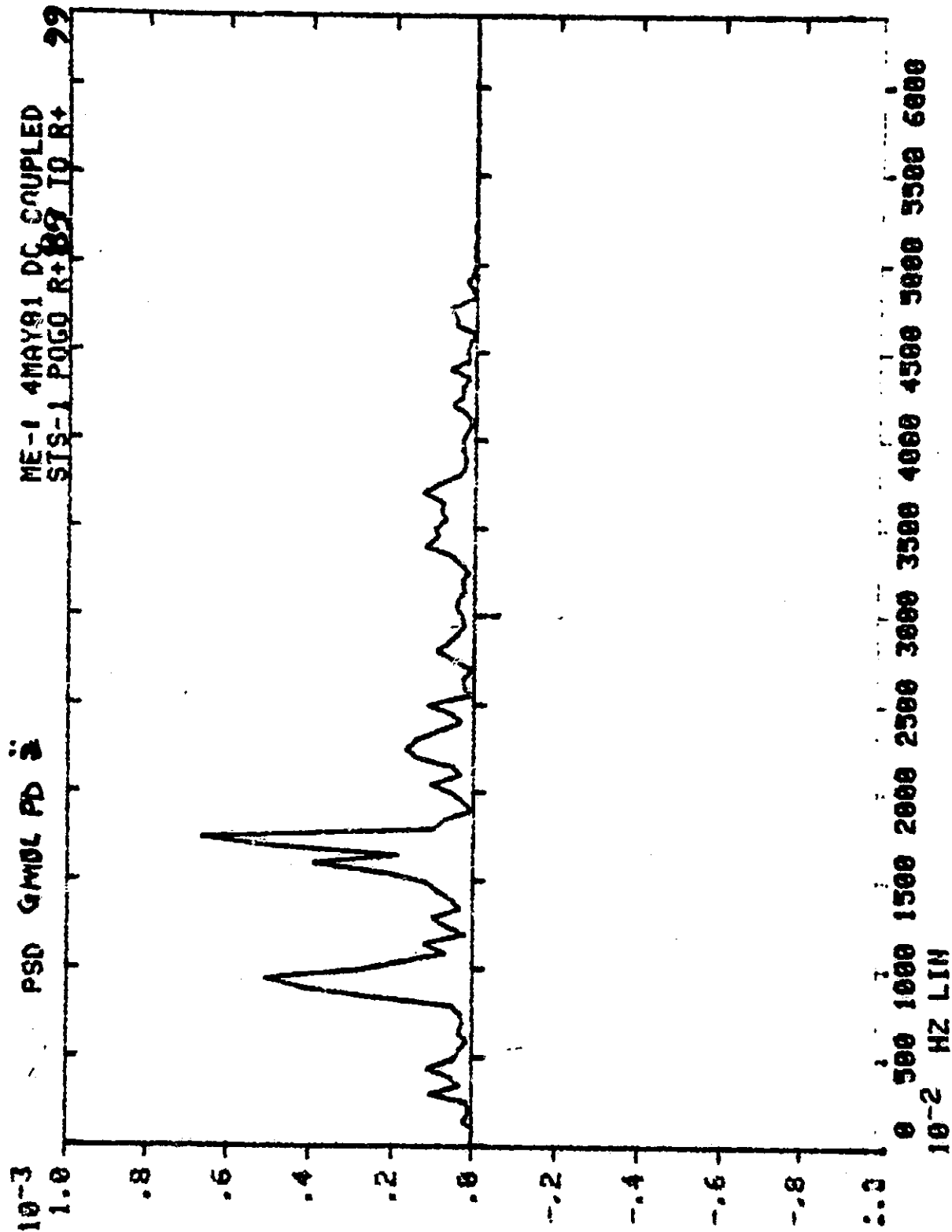


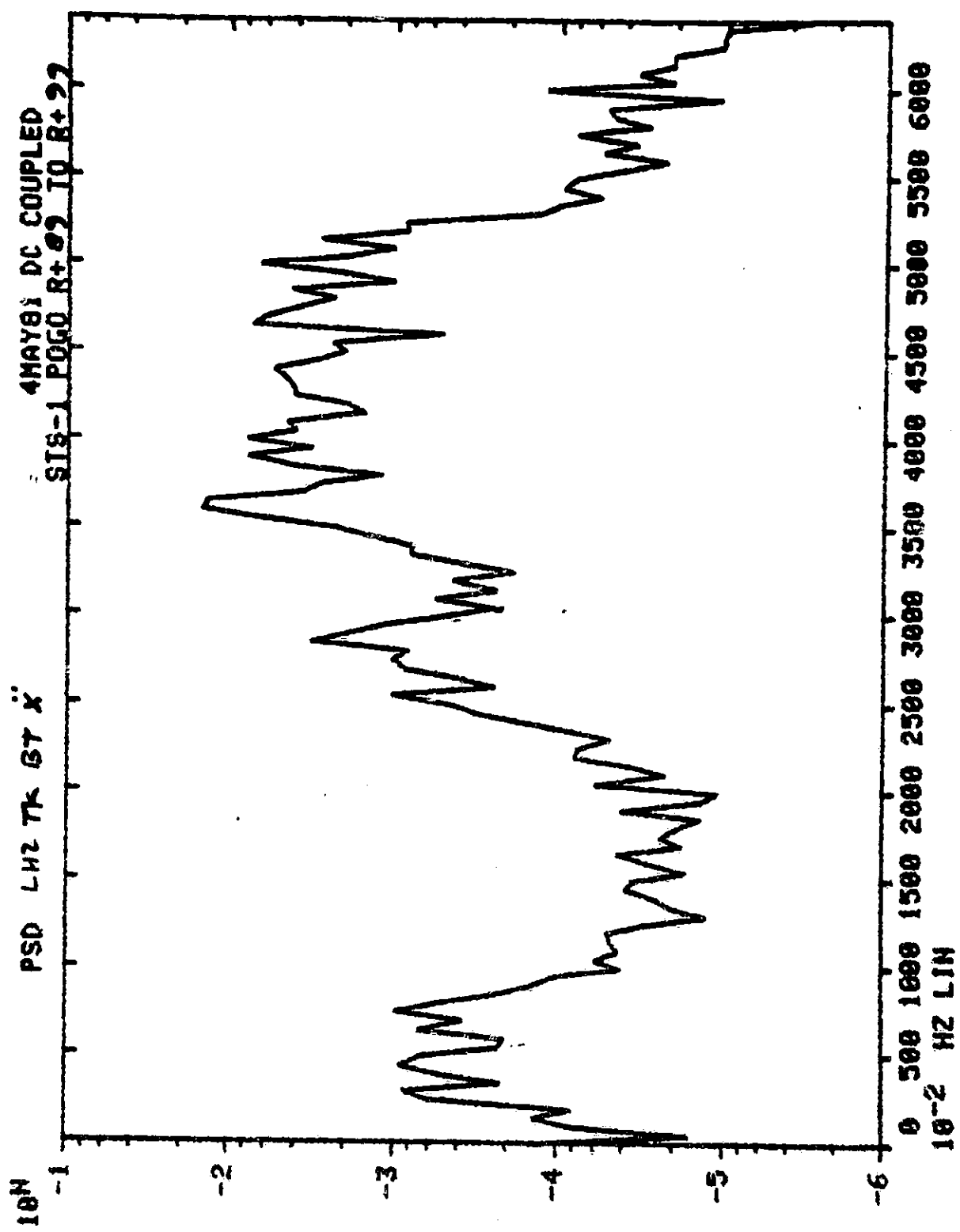


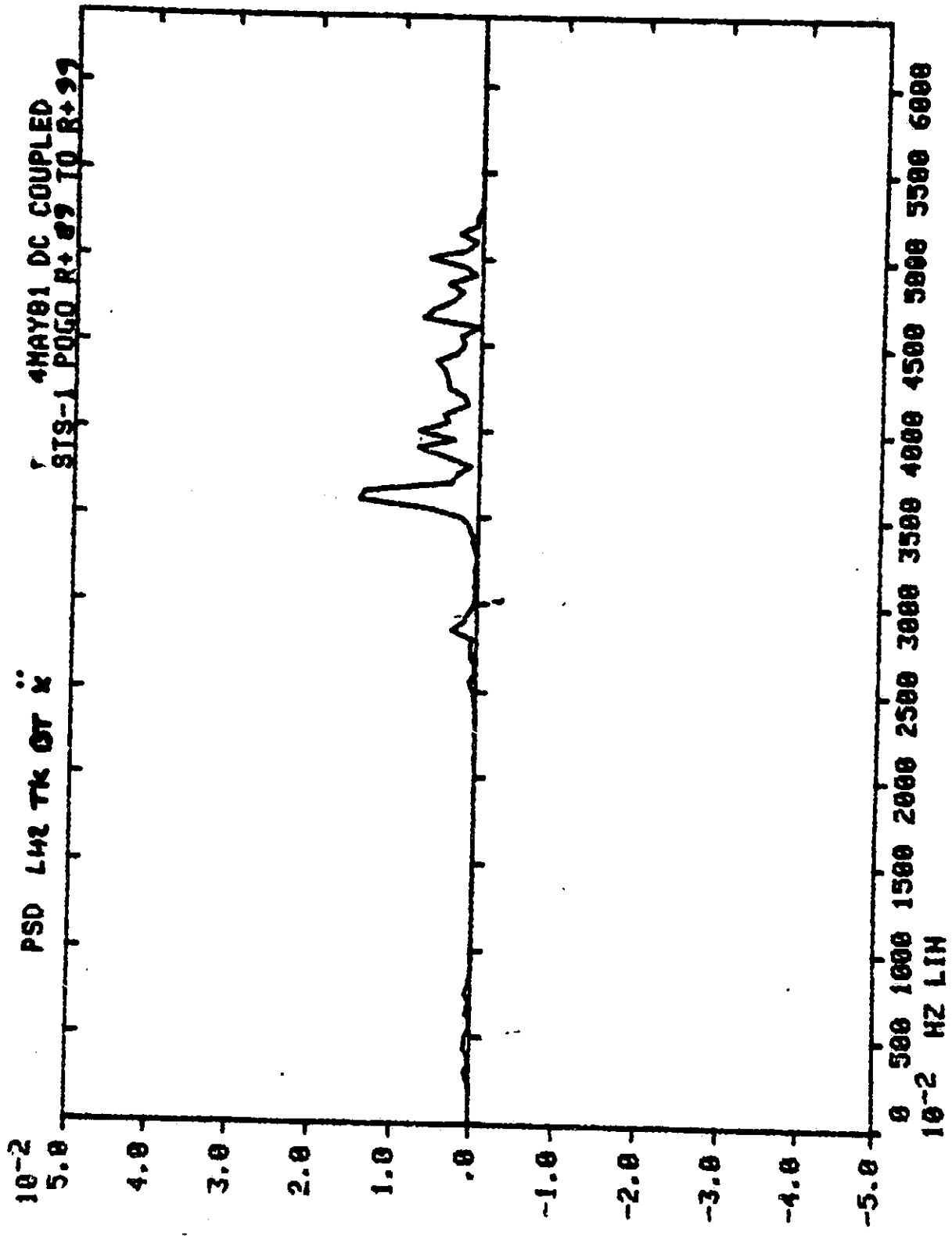


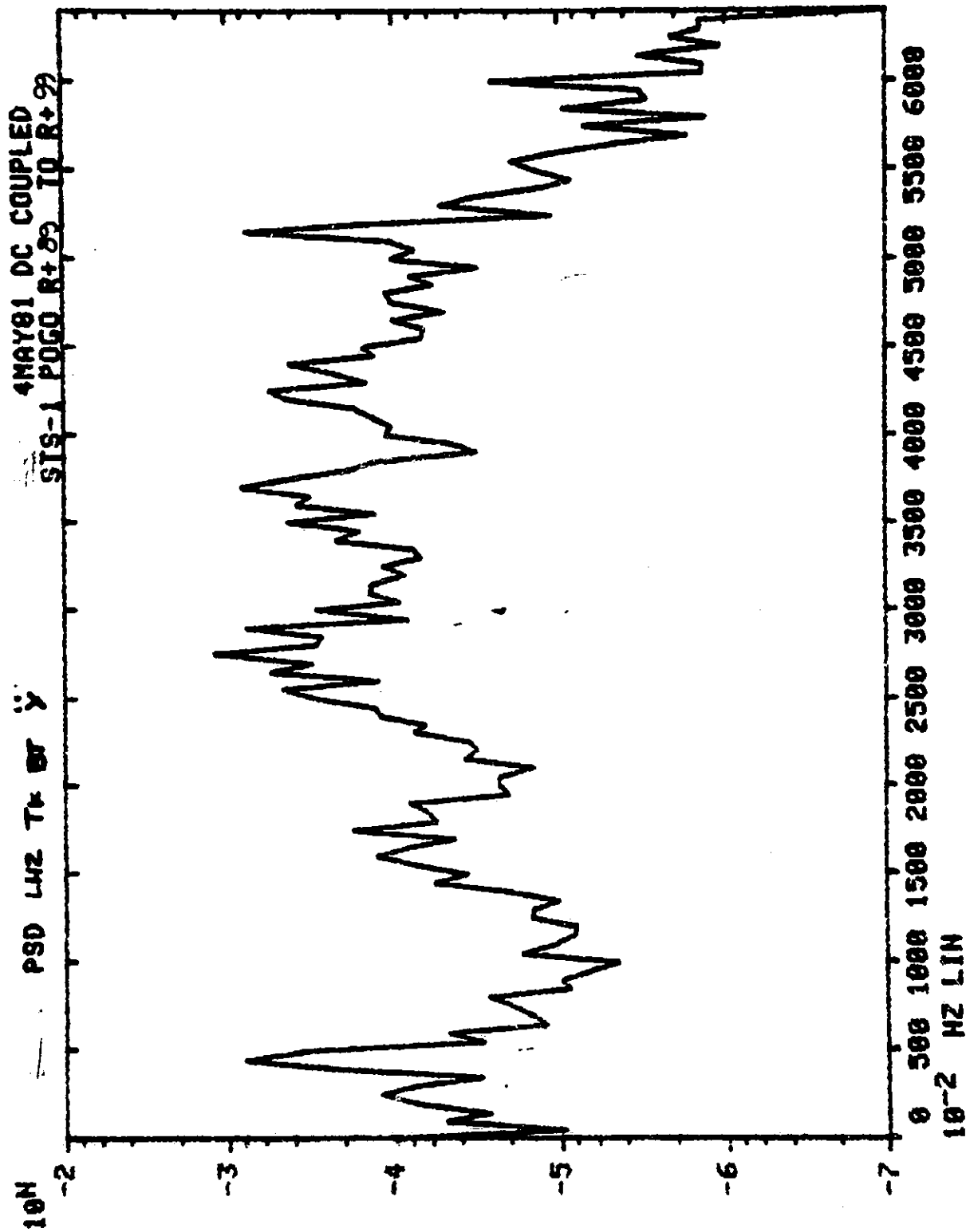


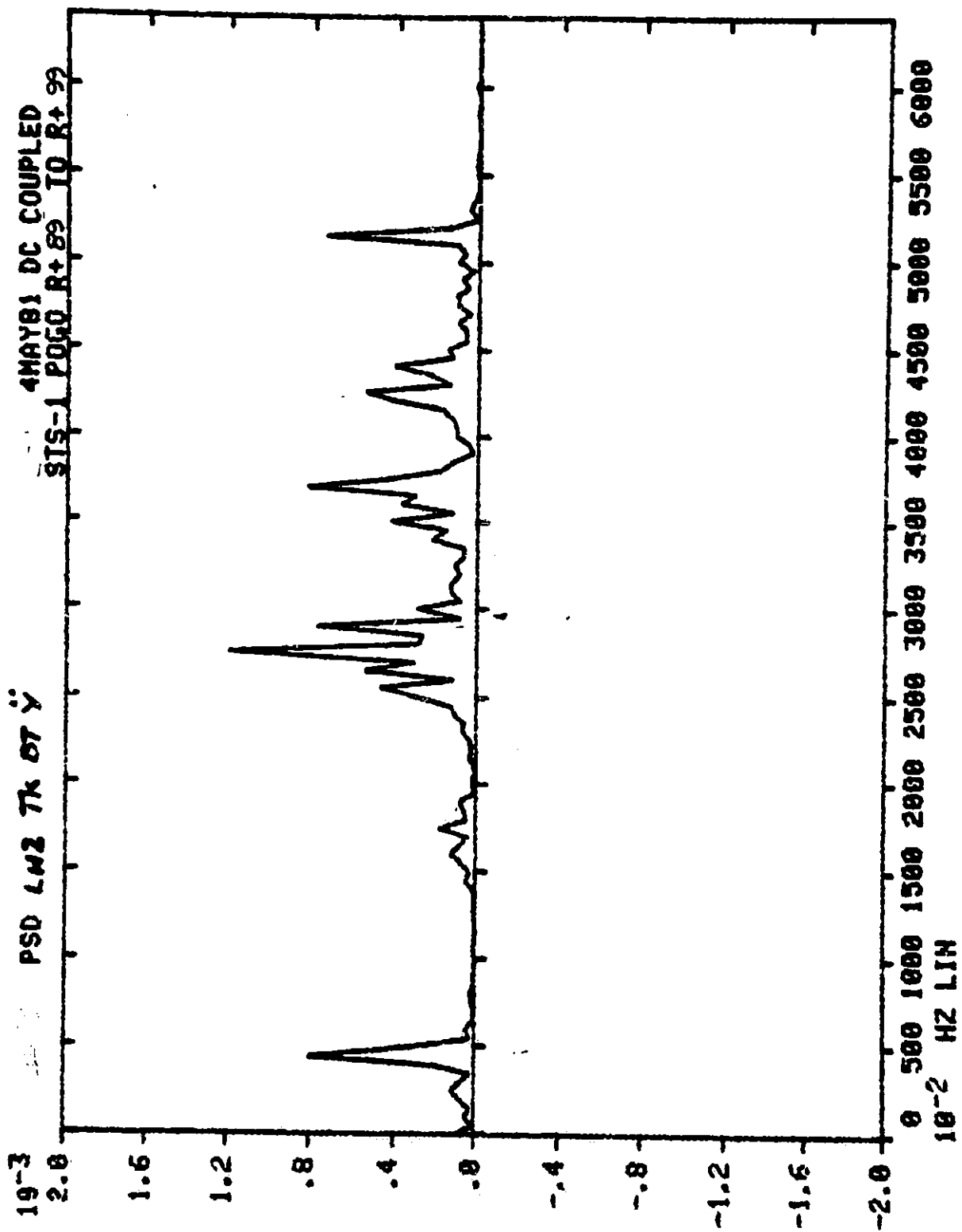


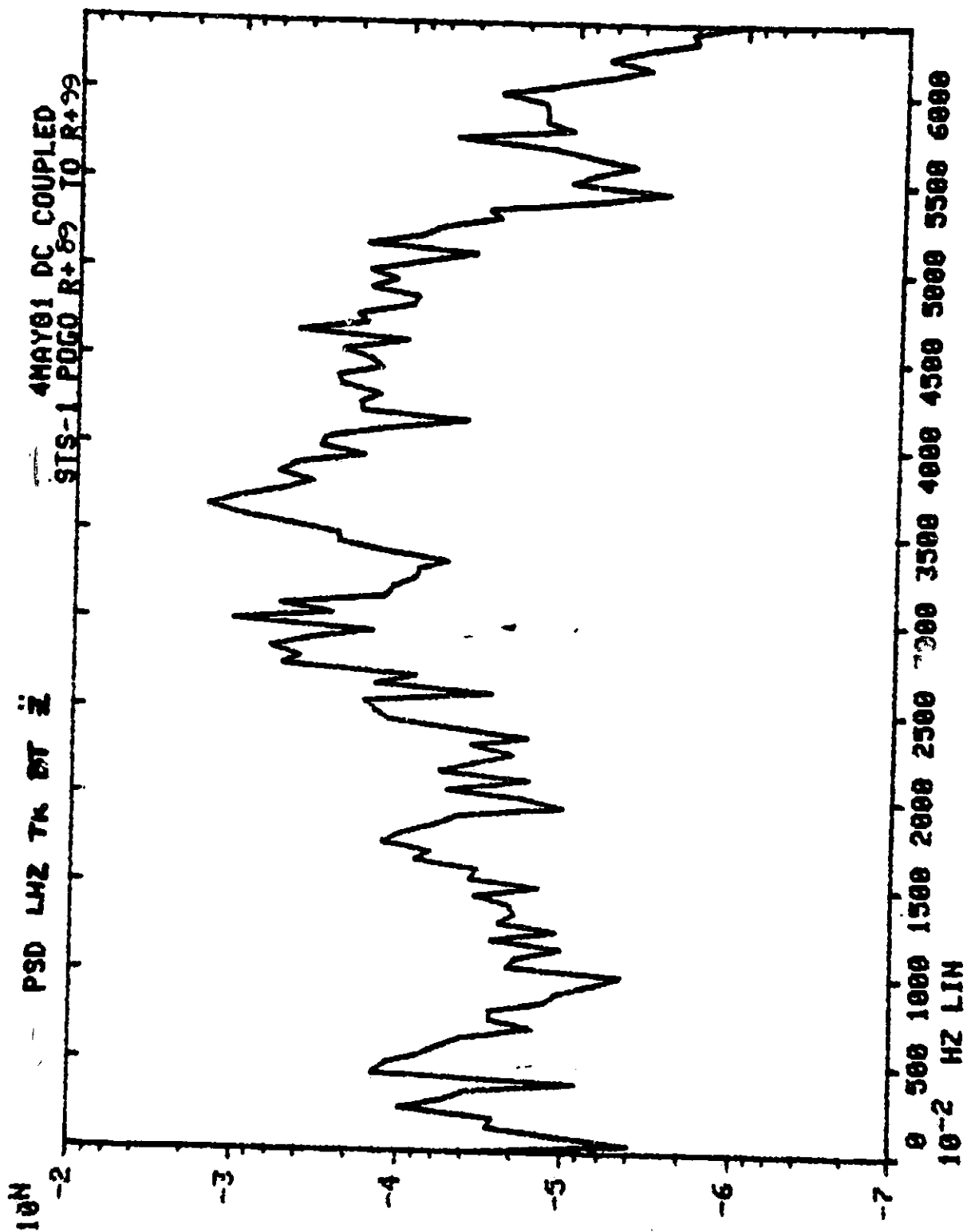


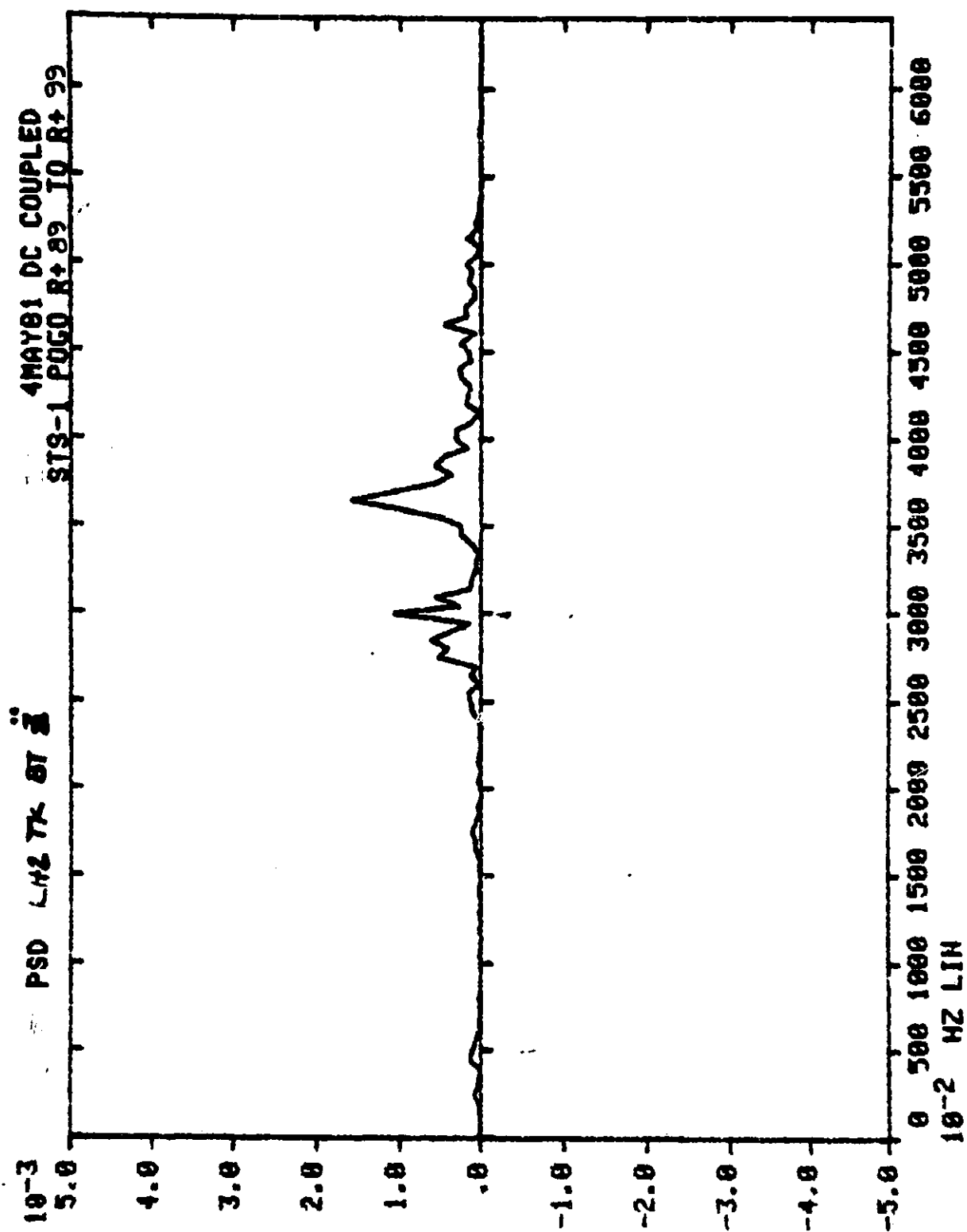




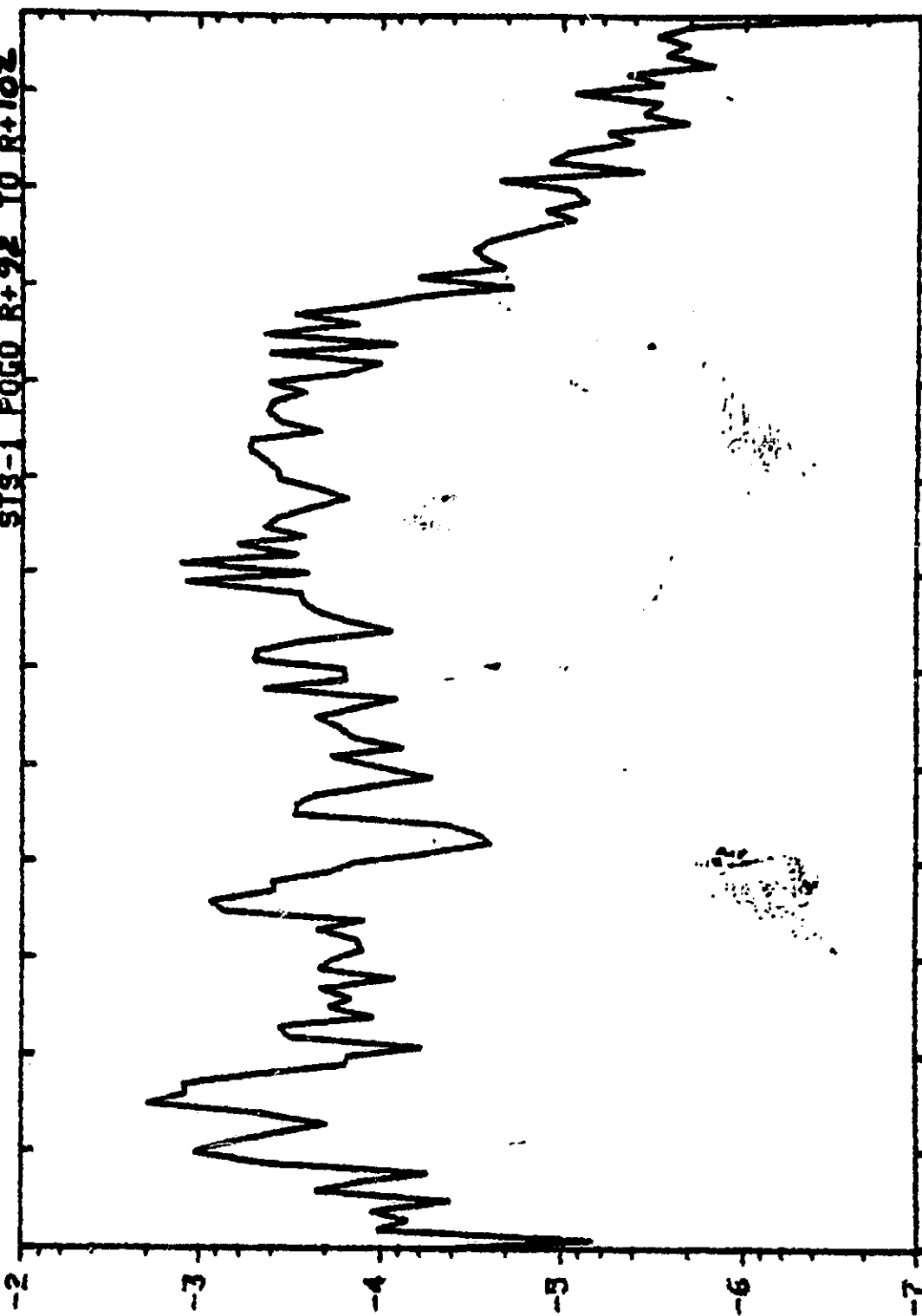


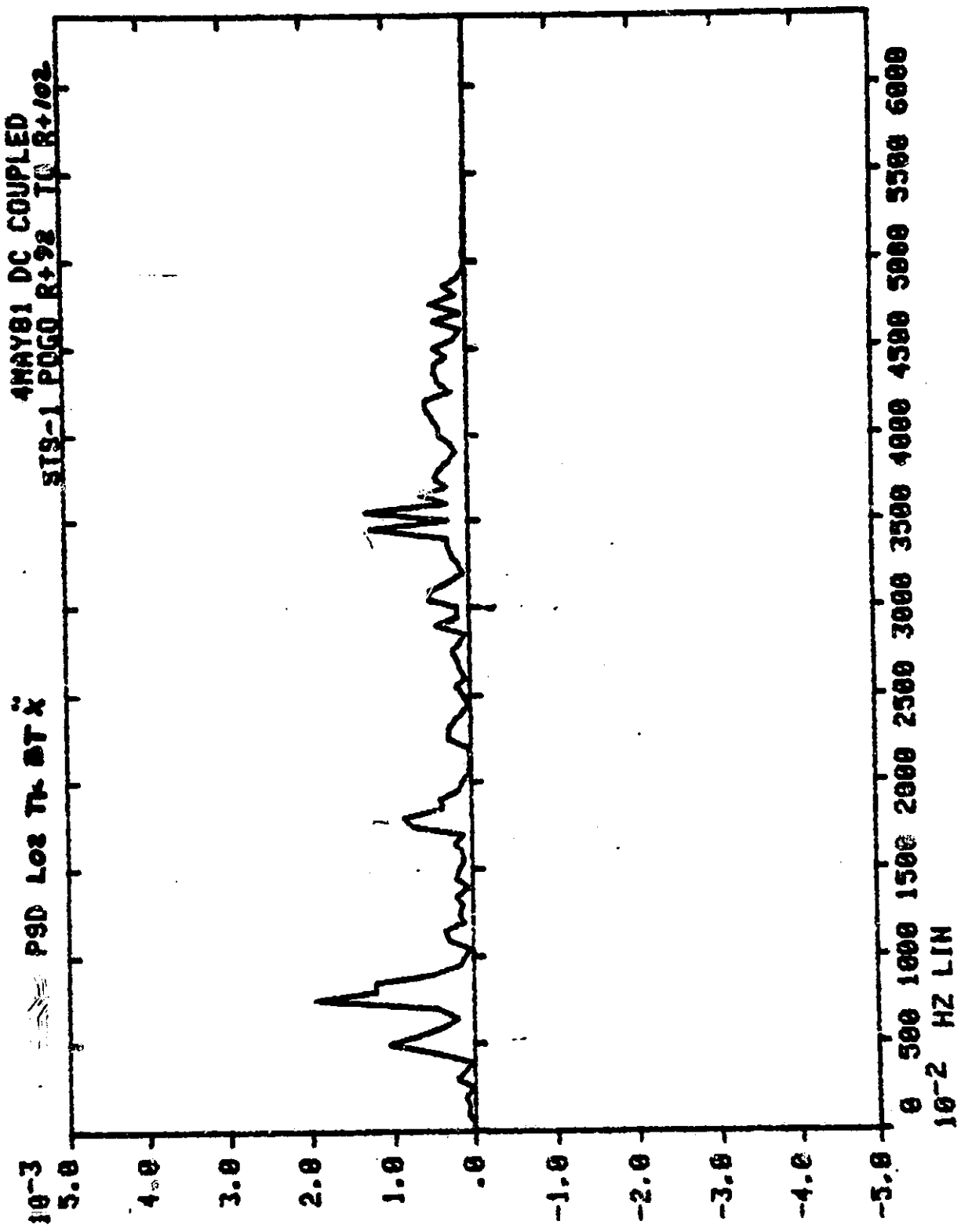


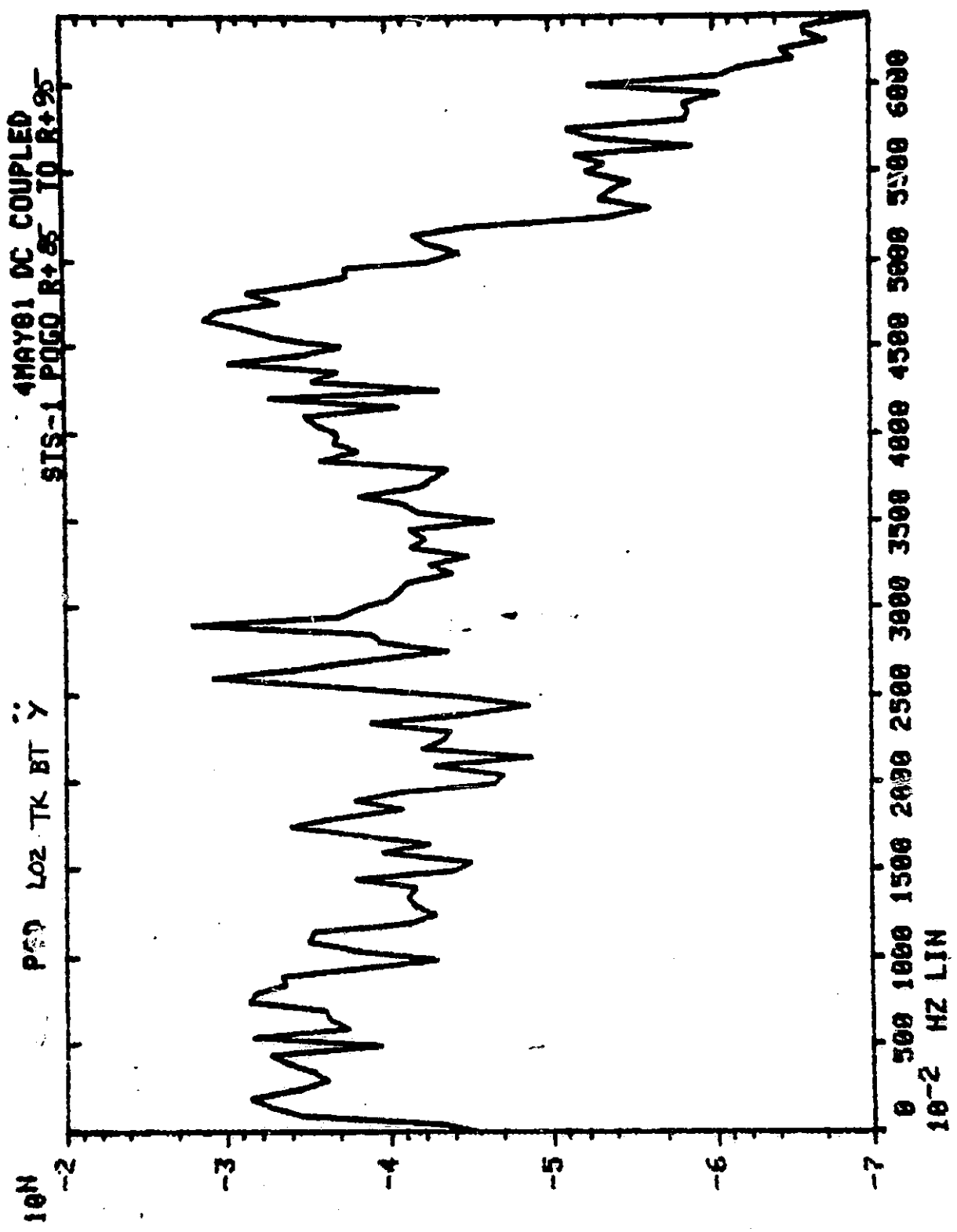




164 PSD LOZ 7K BT X
4MAY81 DC COUPLED
SIS-1 POGO R+92 TO R+102







4MAY81 DC COUPLED
STS-1 POGO R+85 TO R+95

PSD LO2 TK BT Y

10⁻³

2.0

1.6

1.2

.8

.4

.0

-.4

-.8

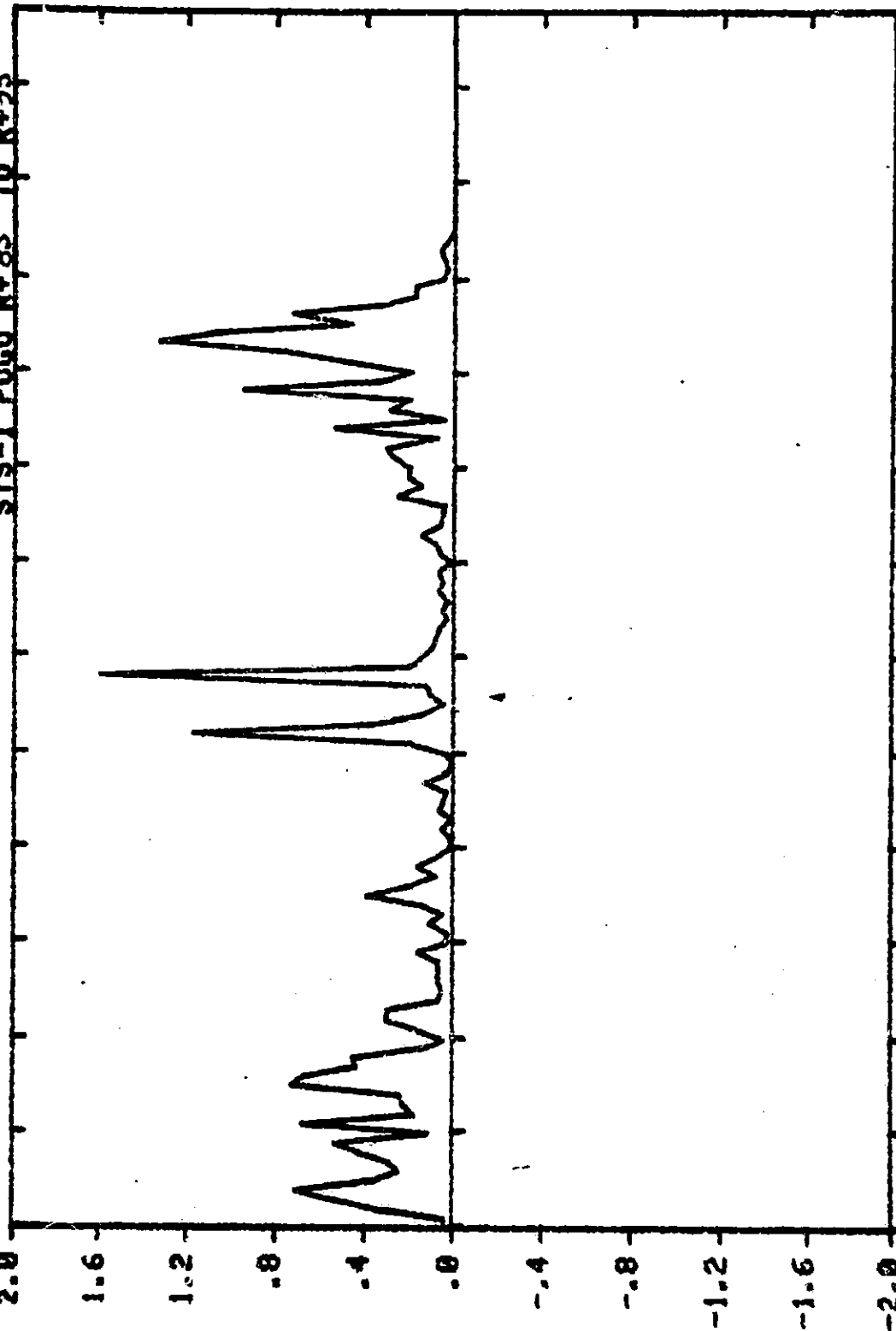
-1.2

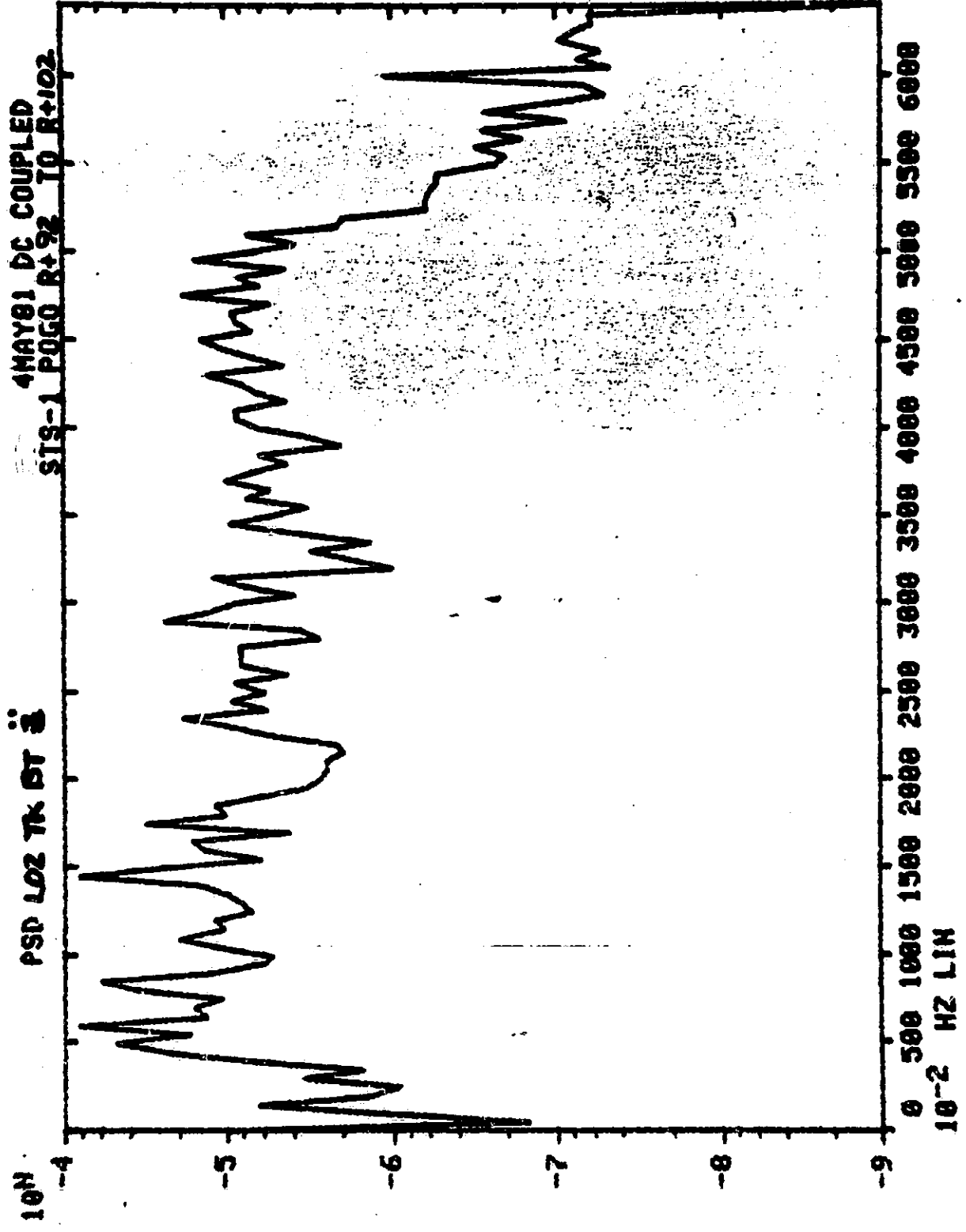
-1.6

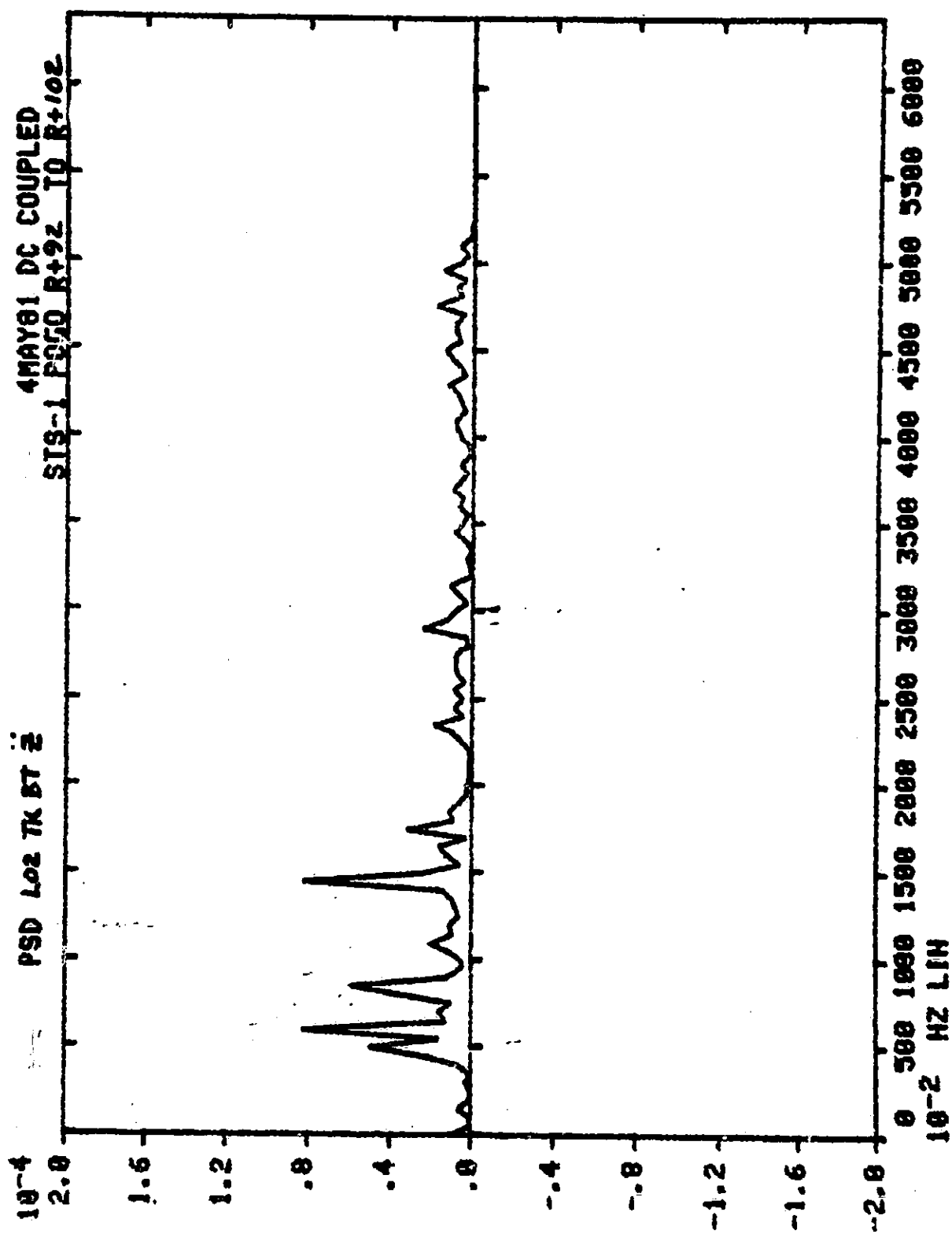
-2.0

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000

10⁻² HZ LIN







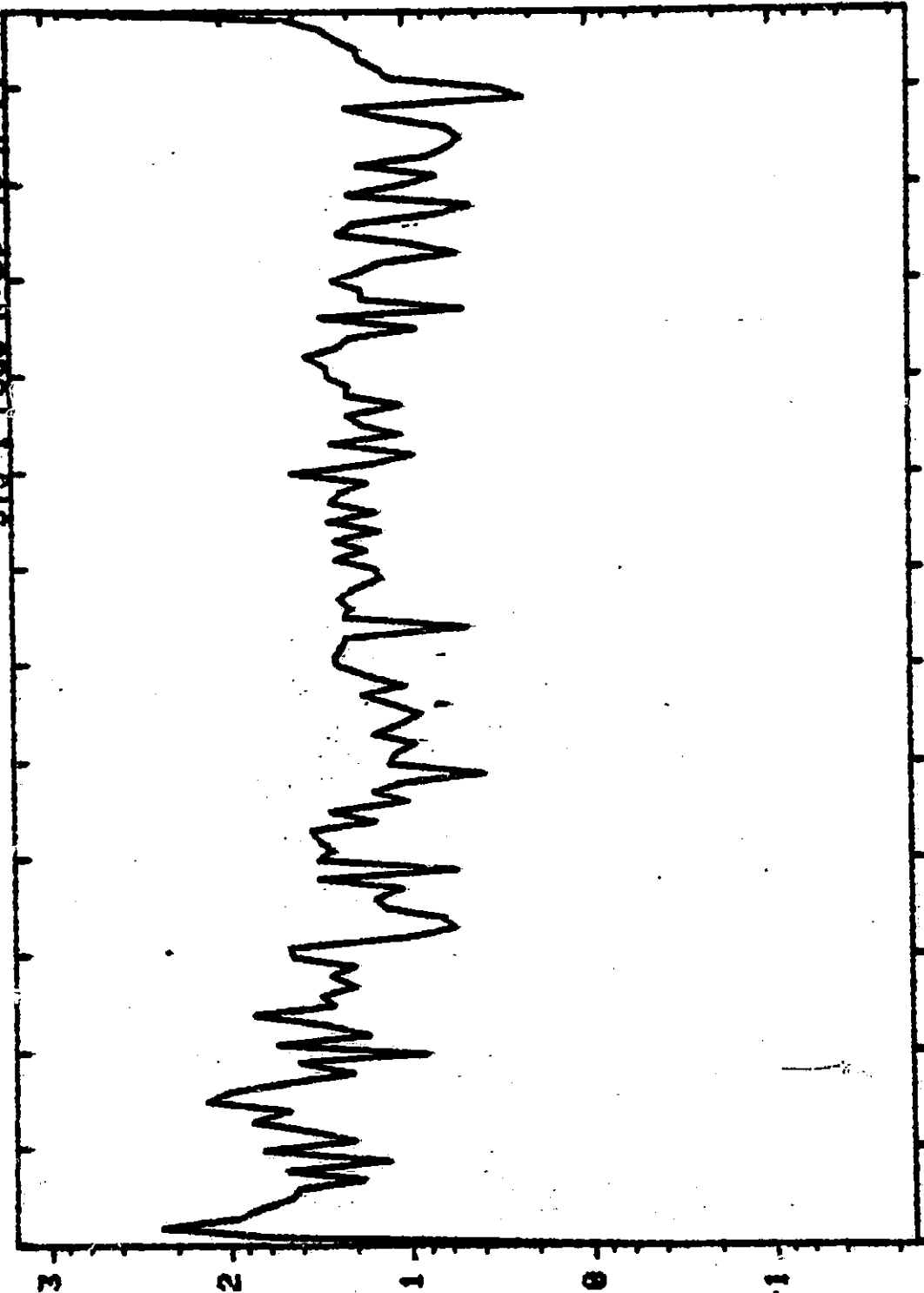
ORGANIZATION: SYSTEMS DYNAMICS LABORATORY	MARSHALL SPACE FLIGHT CENTER STS-1 POGO ANALYSIS	NAME: R. JEWELL DATE: MAY 1981
<p style="text-align: center;"> TRANSFER FUNCTION SHOWING CORRELATION BETWEEN MCC/GIMBAL PAD X - BEFORE SRB SEPARATION - AFTER SRB SEPARATION </p>		

MEG/CMOL 10² X

H(f) - Polar

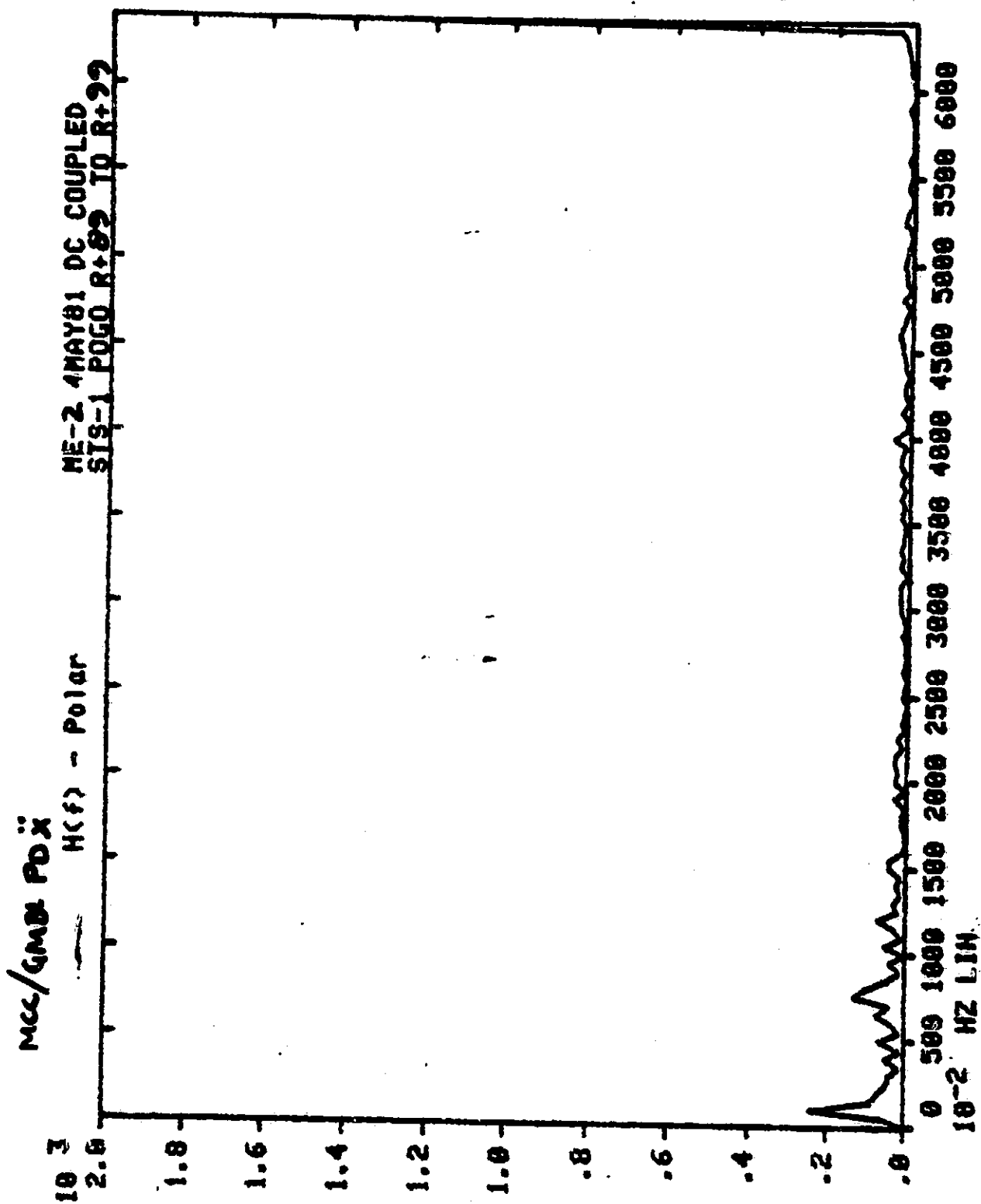
ME-2 4MAY81 DC COUPLED
STS-1 POGO R+R2 TO R+R2

10M



0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000

10⁻² HZ LIN

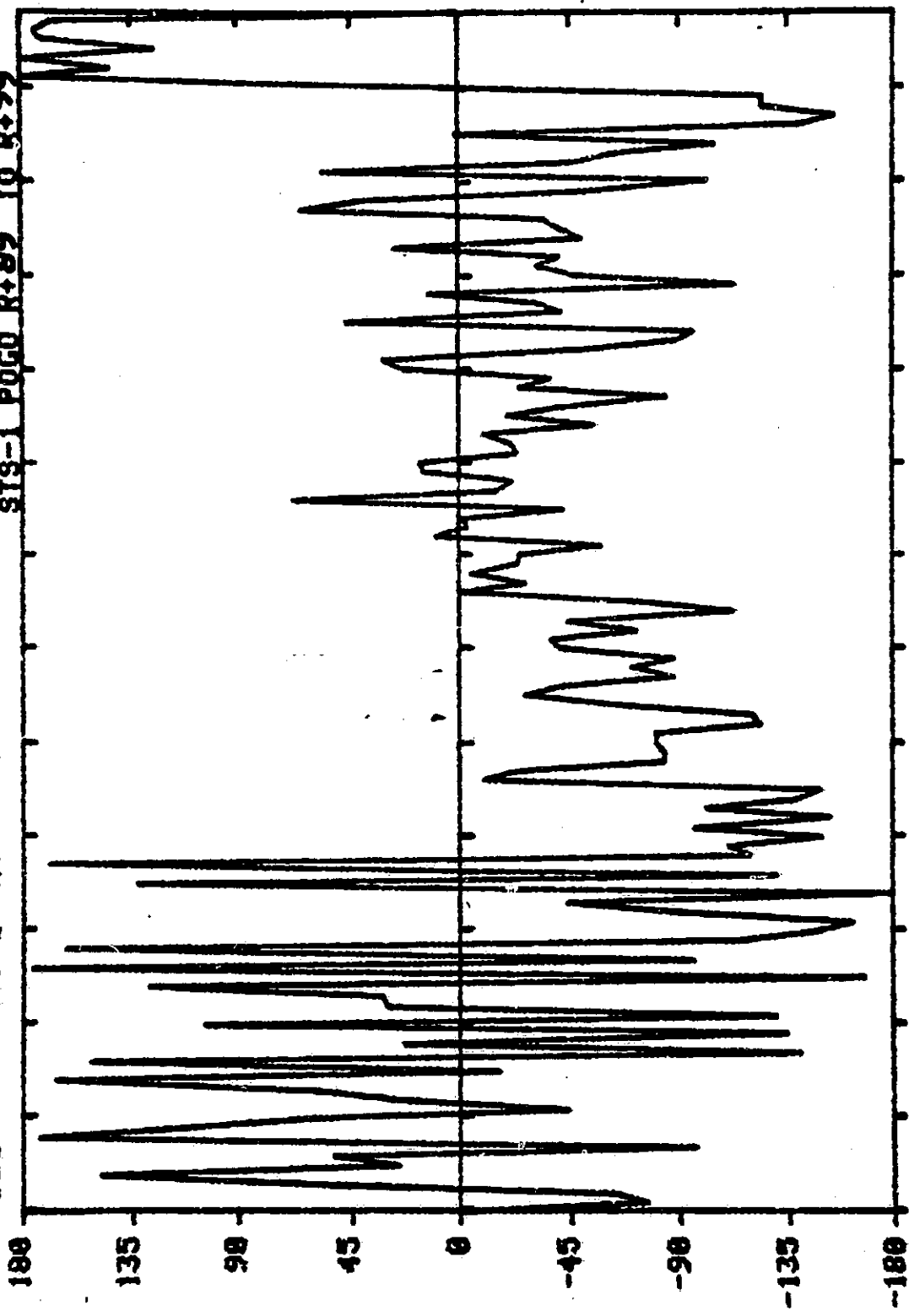


MCC/CMBL PPX

H(f) - Polar

ME-2 4MAY81 DC COUPLED
STS-1 POGO R+89 TO R+99

DEG

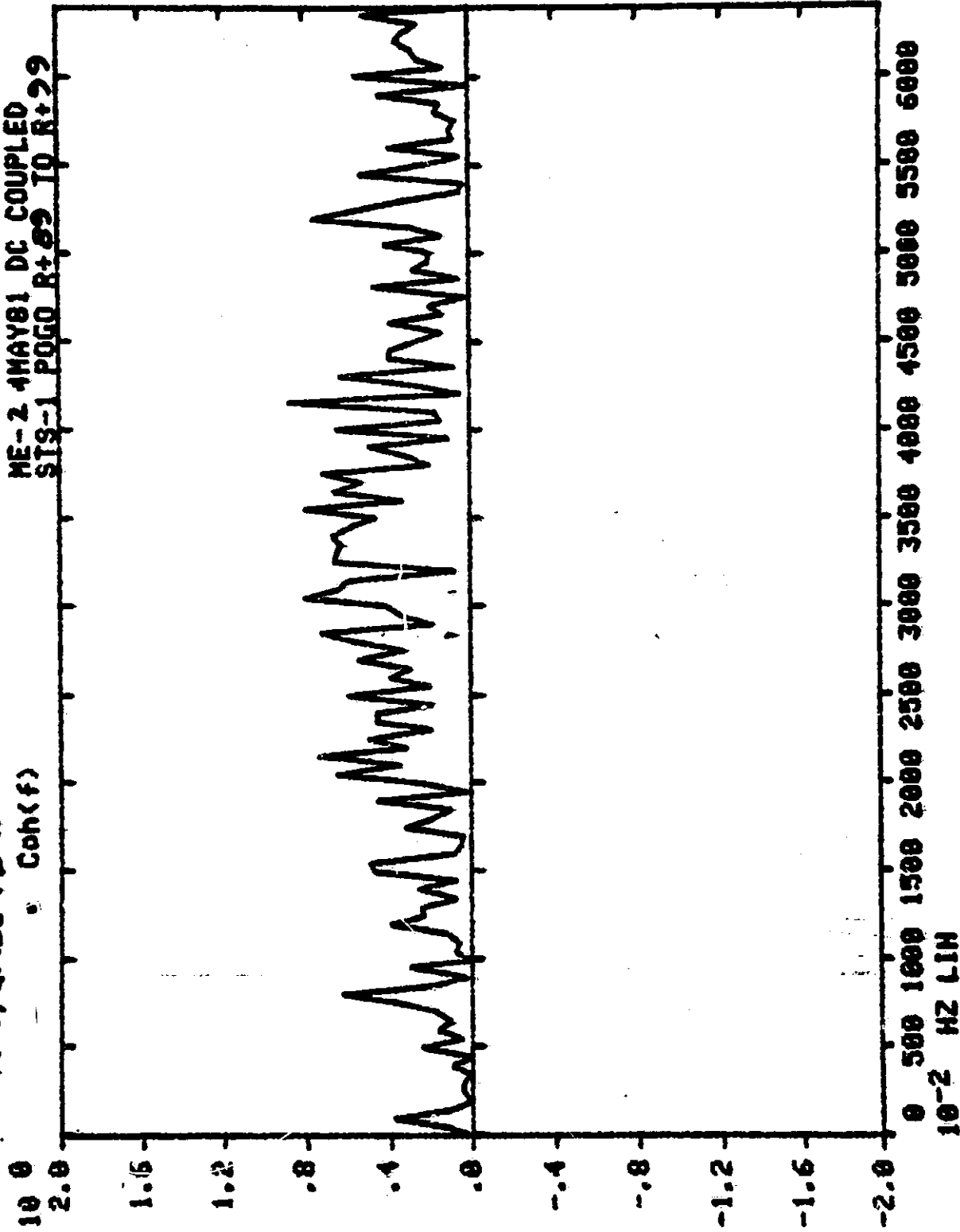


0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000

10⁻² HZ LIN

MCC/GM81 PD \ddot{x}
Coh(f)

ME-2 4MAY81 DC COUPLED
STS-1 POGO R+69 TO R+99



MCC/GMBL PD X

Direct H(f) - Polar

ME-1 4MAY81 DC COUPLED

SIG-1 PQGG R+390 IQ R+426

10H

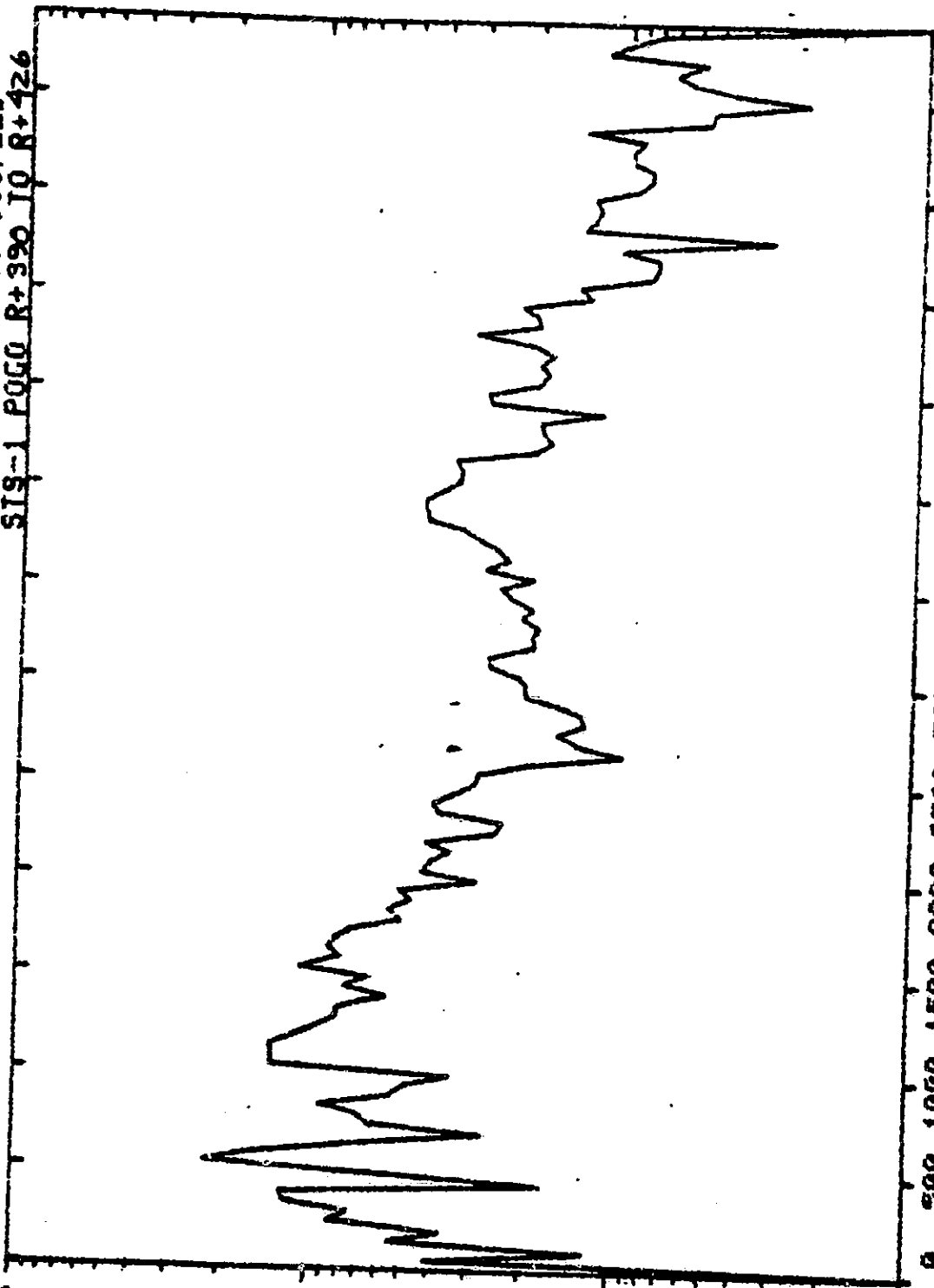
3

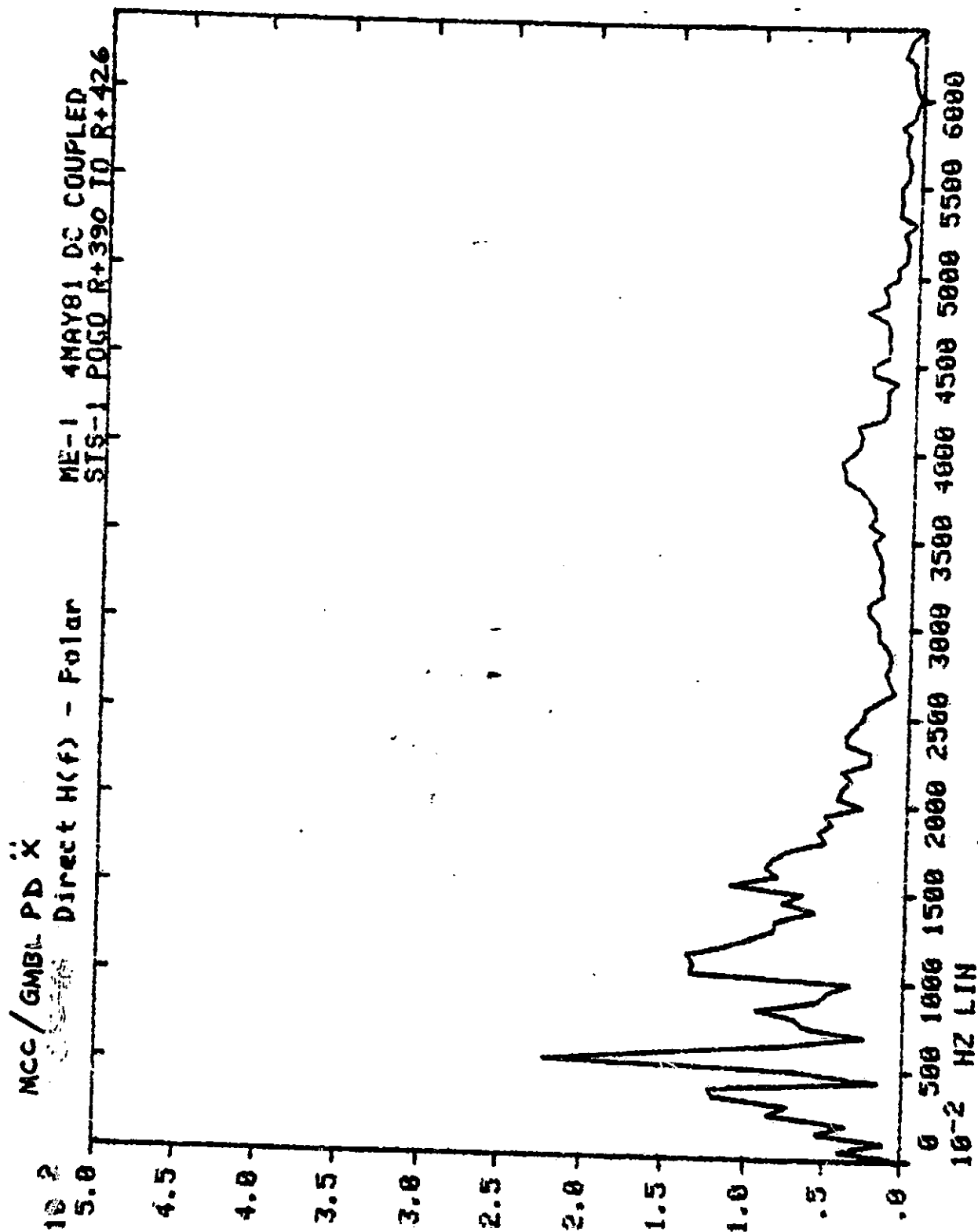
2

1

0

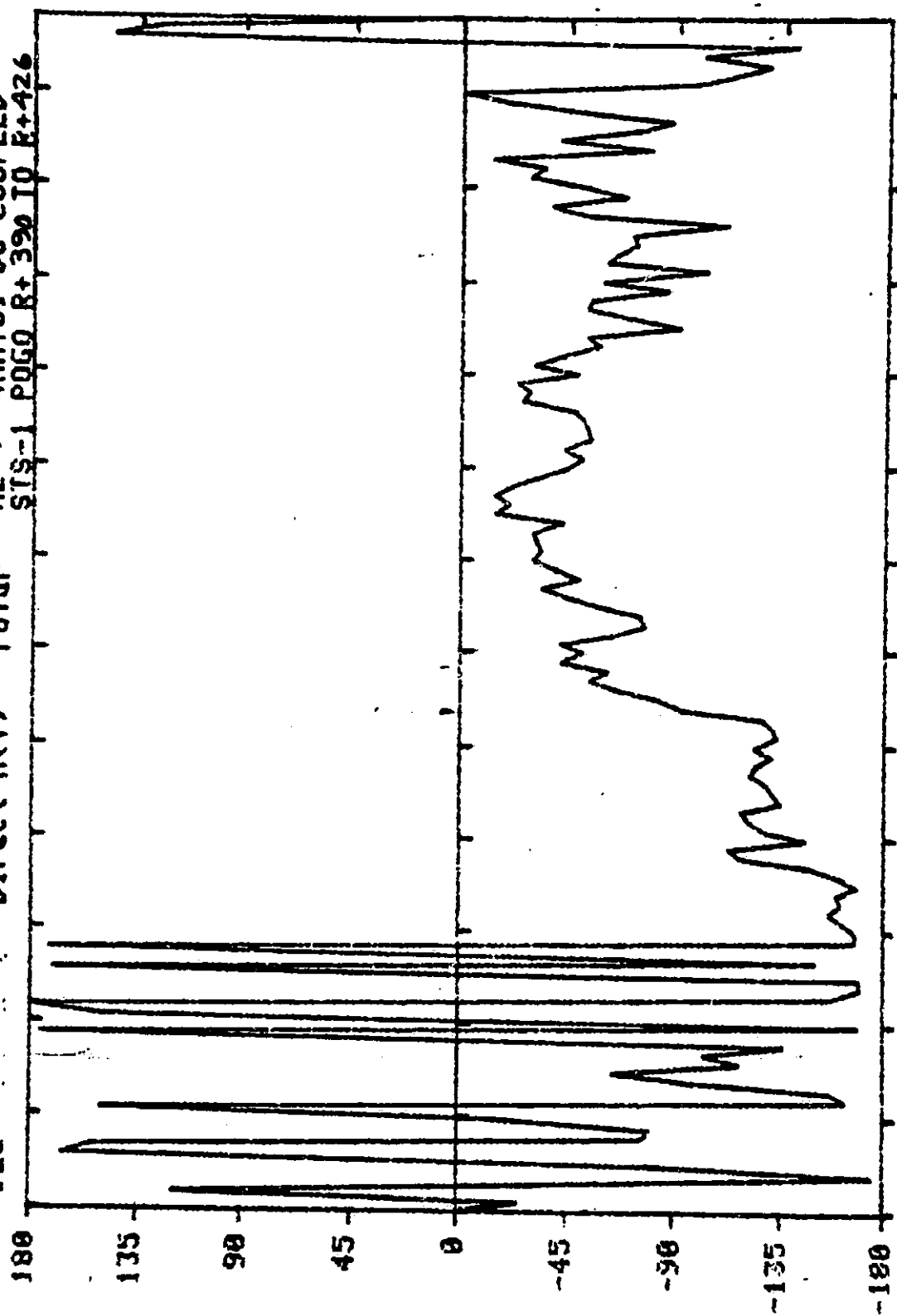
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000
10-2 HZ L/H





MCC/GMBL PD X
Direct H(f) - Polar
ME-1 4MAY61 DC COUPLED
STS-1 PQGQ R+390 IQ R+426

DEG



0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000
10⁻² HZ LIN

MCC/GMBL PD X

Direct Coh(f)

ME-1 4MAY81 DC COUPLED
STS-1 POGO R+390 TO R+426

10 0

2.0

1.6

1.2

.8

.4

.0

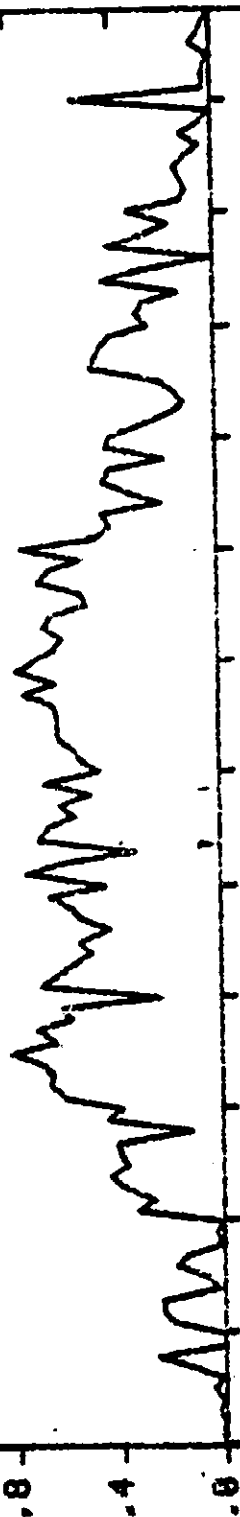
-.4

-.8

-1.2

-1.6

-2.0



0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000

10⁻² HZ LIN

ORGANIZATION: SYSTEMS DYNAMICS LABORATORY	MARSHALL SPACE FLIGHT CENTER STS-1 POGO ANALYSIS	NAME: R. JEWELL DATE: MAY 1981
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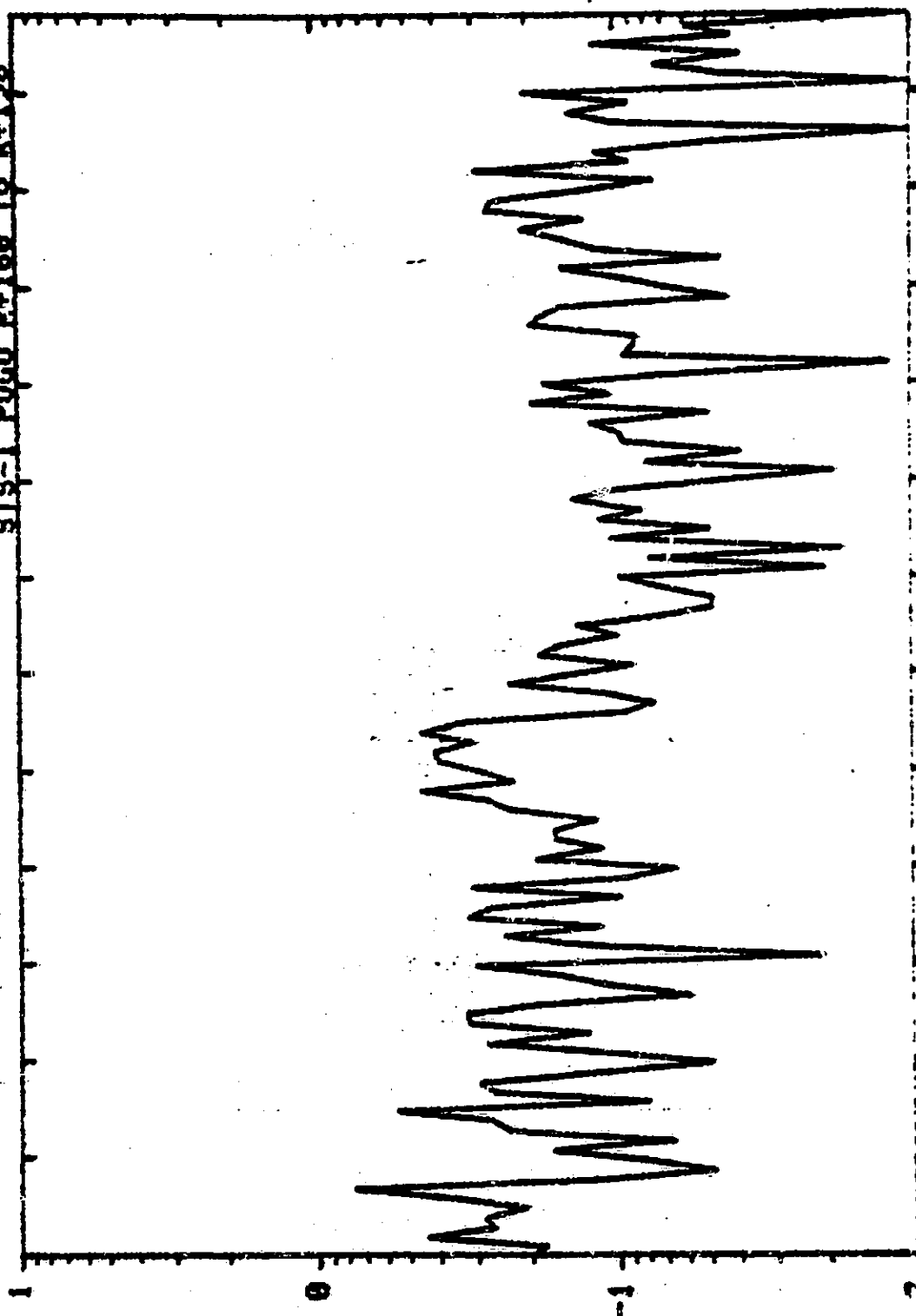
TRANSFER FUNCTION SHOWING 26 HZ COHERENT ENERGY

- * MCC/LPOP
 - * GIMBAL PAD X/LPOP
 - * HPOP/LPOP @ 65% PWL
- } 100% PWL

ME-1 27APR81 DC COUPLED
STS-1 P050 R+160 IQ R+196

MCC/LPOP Direct H(f) - Polar

10N

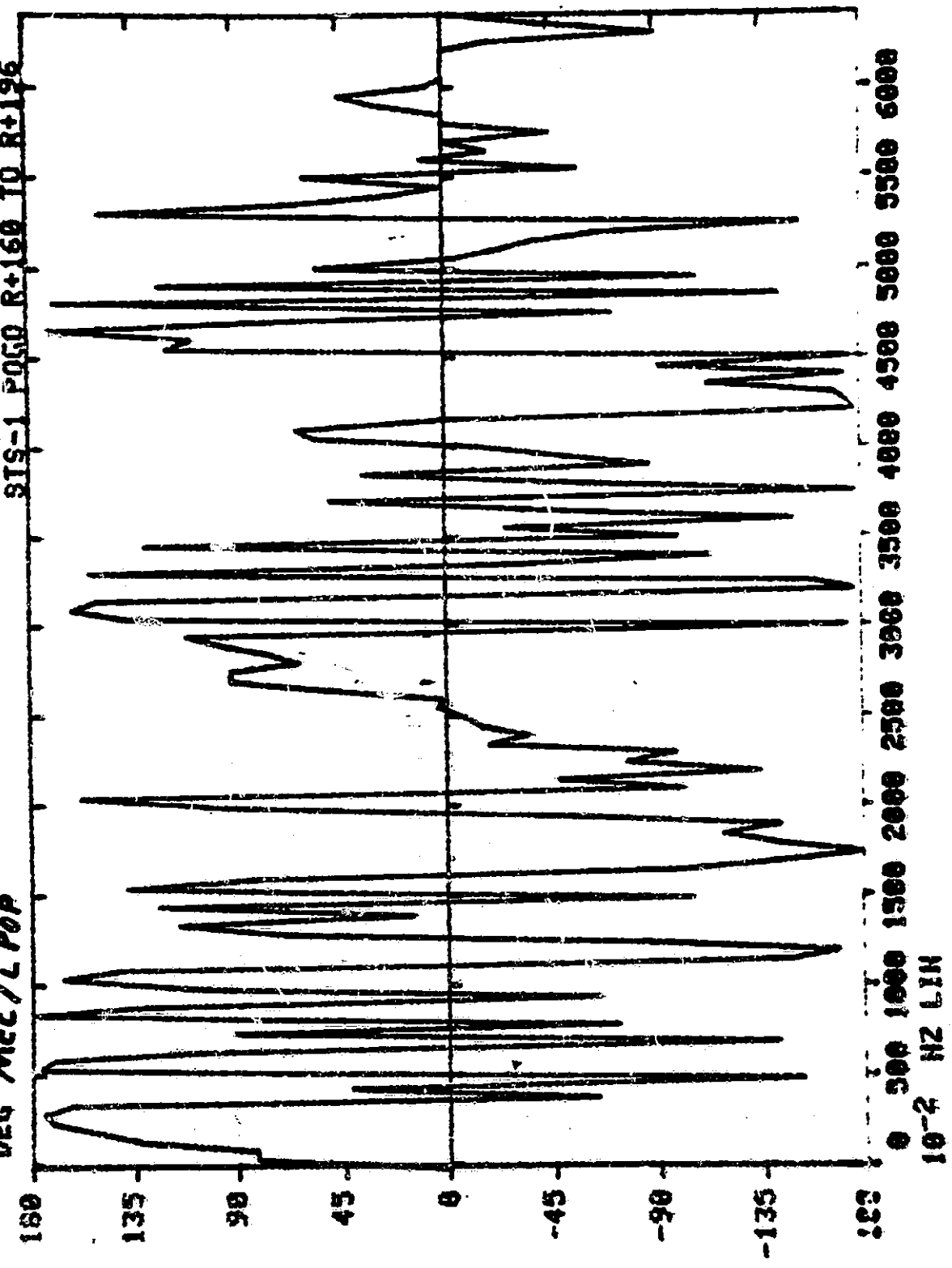


0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000

10^-2 HZ LIN

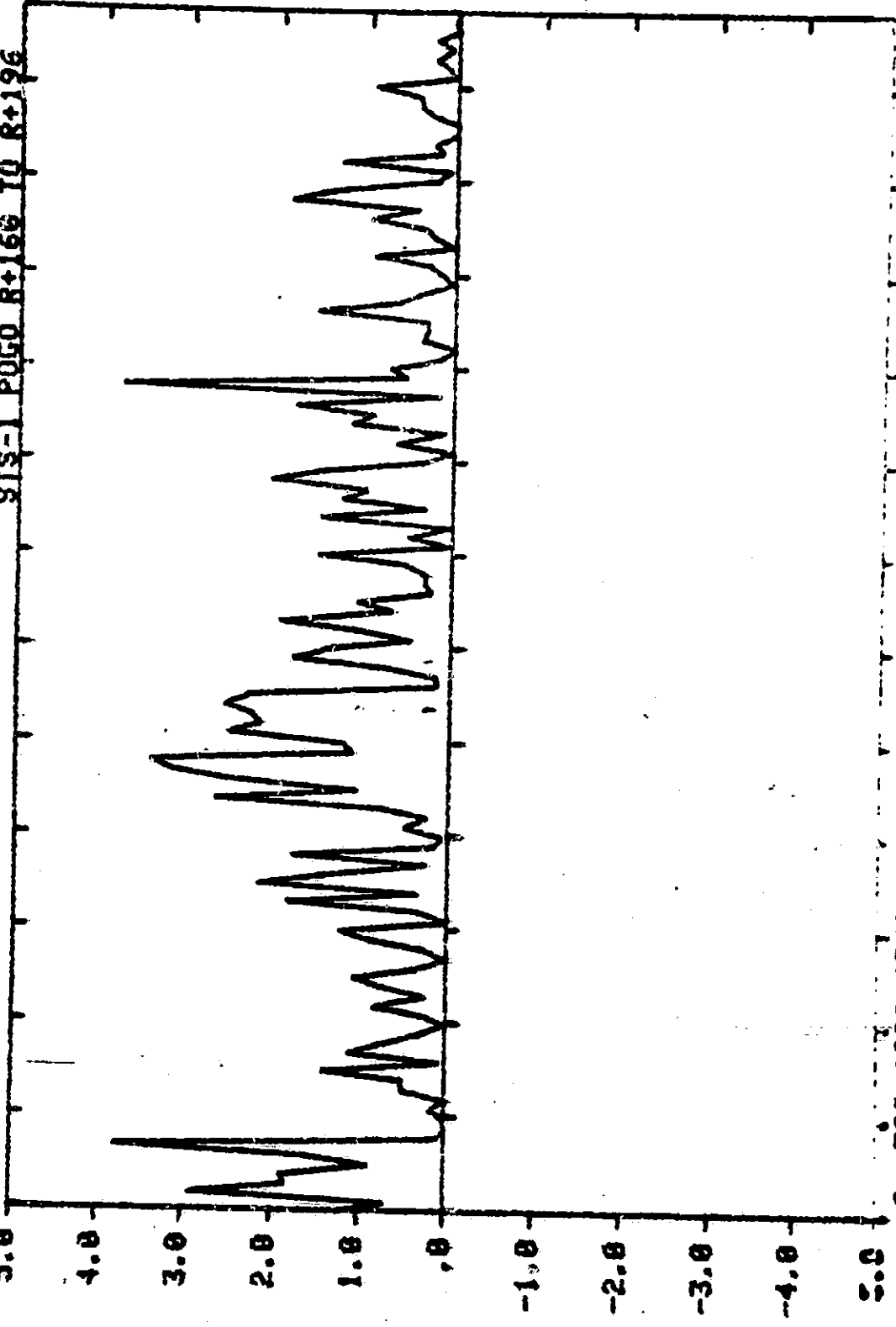
ME-1 27APR81 DC COUPLED
STS-1 POGO R+160 TO R+196

DEG MEC/L POP



ME-1 27APR61 DC COUPLED
SIS-1 POGO R+16% TO R+19%

MCC/LPOP Direct Con(f)



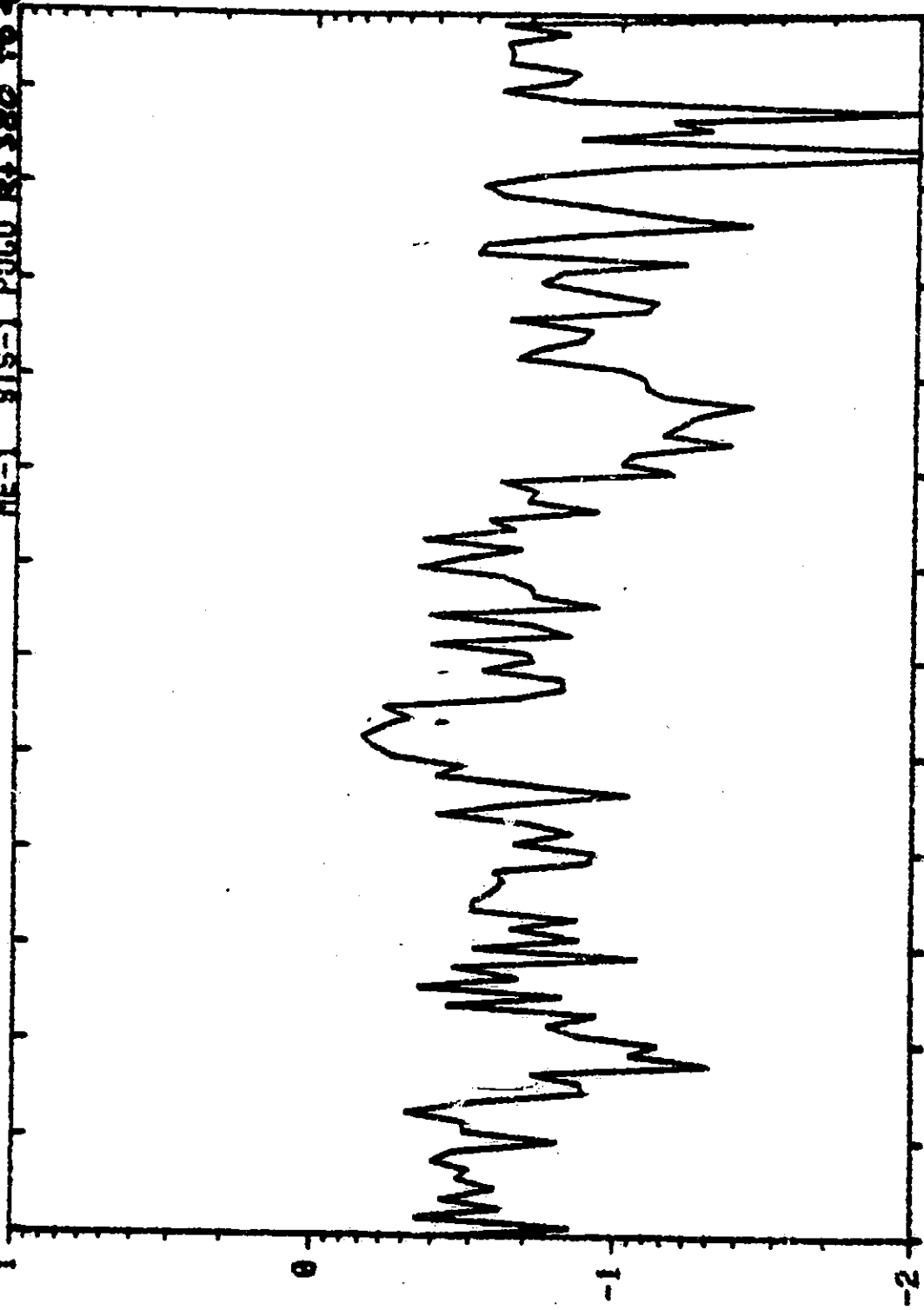
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000
10⁻² HZ LIN

10N

NCC/LPOP Direct H(f) - Polar

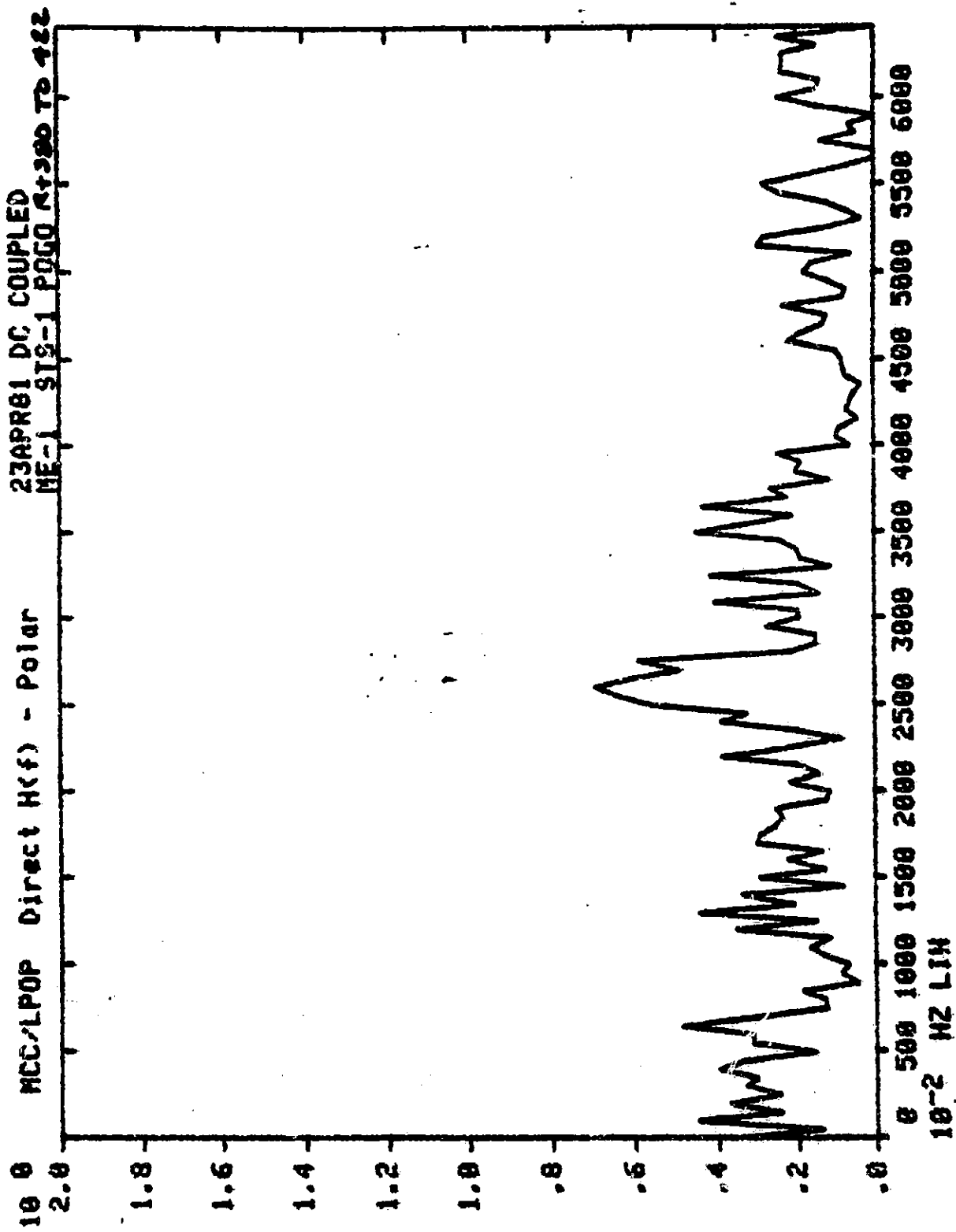
23APR81 DC COUPLED

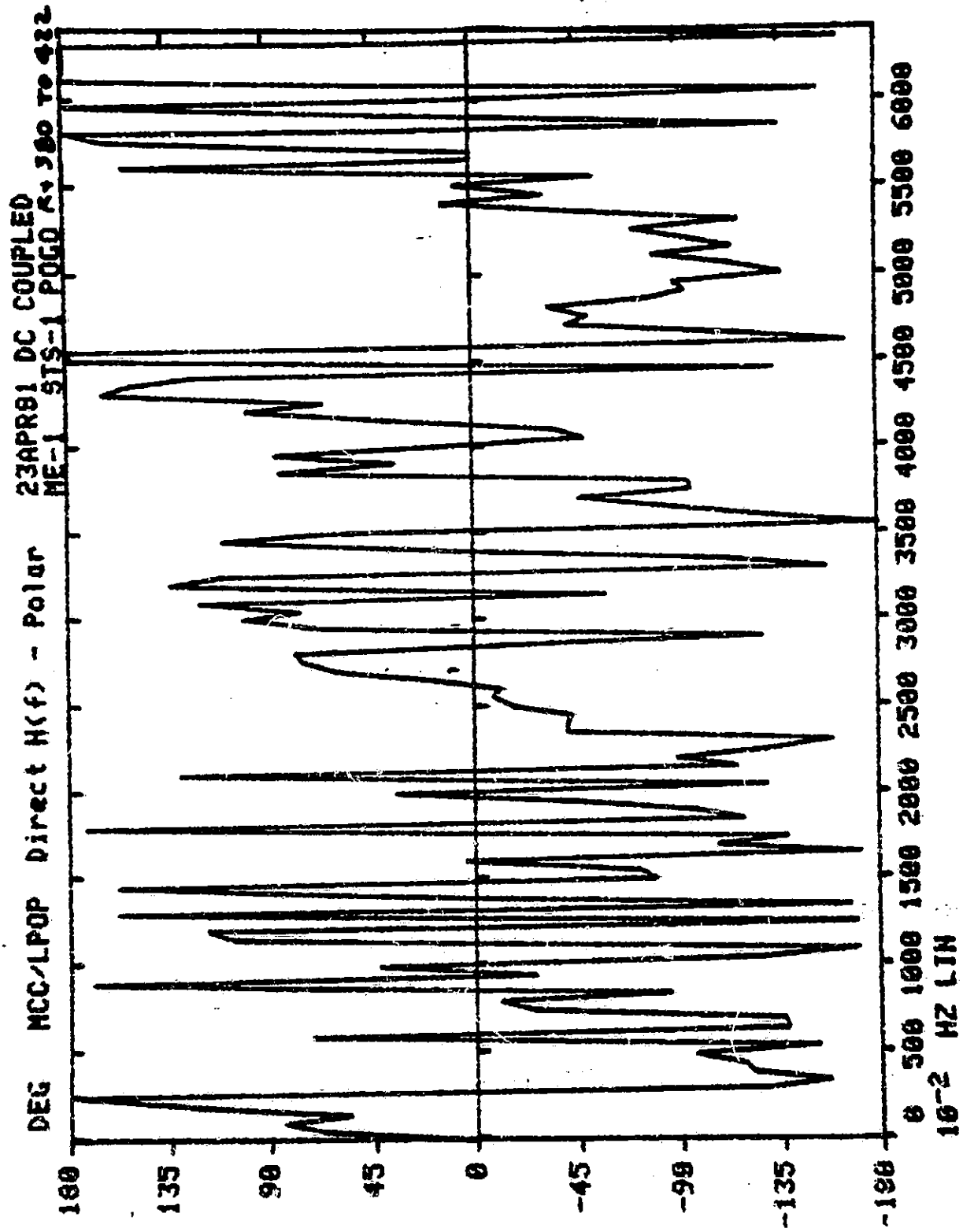
ME-1 815-1 P060 R+180 TD 422



0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000

10^-2 HZ LIN

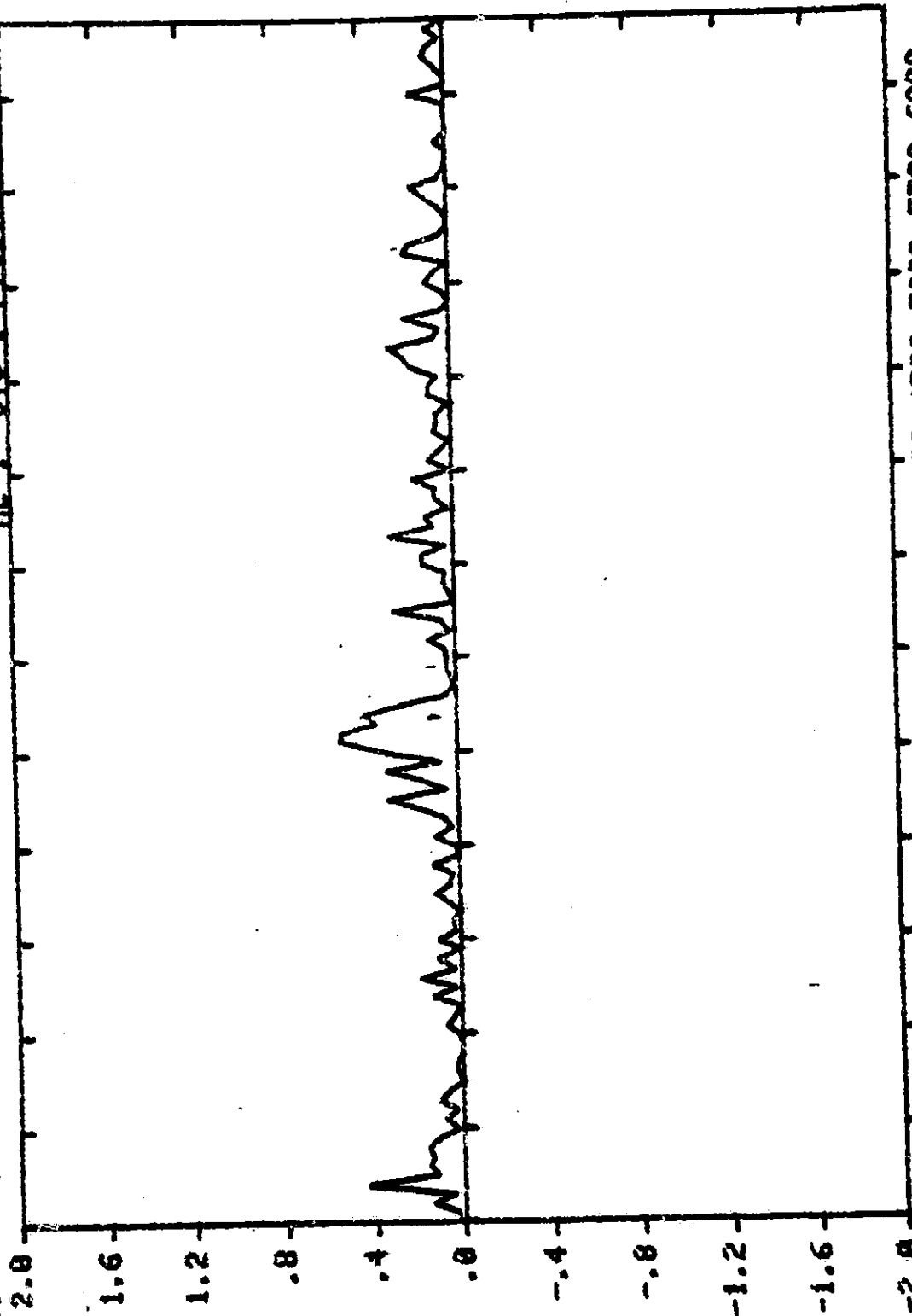




23 APR 81 DC COUPLED
ME-1 SIS-1 POGO R+180 TO 422

NCC/LPOP Direct Coh(f)

10 0



0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000

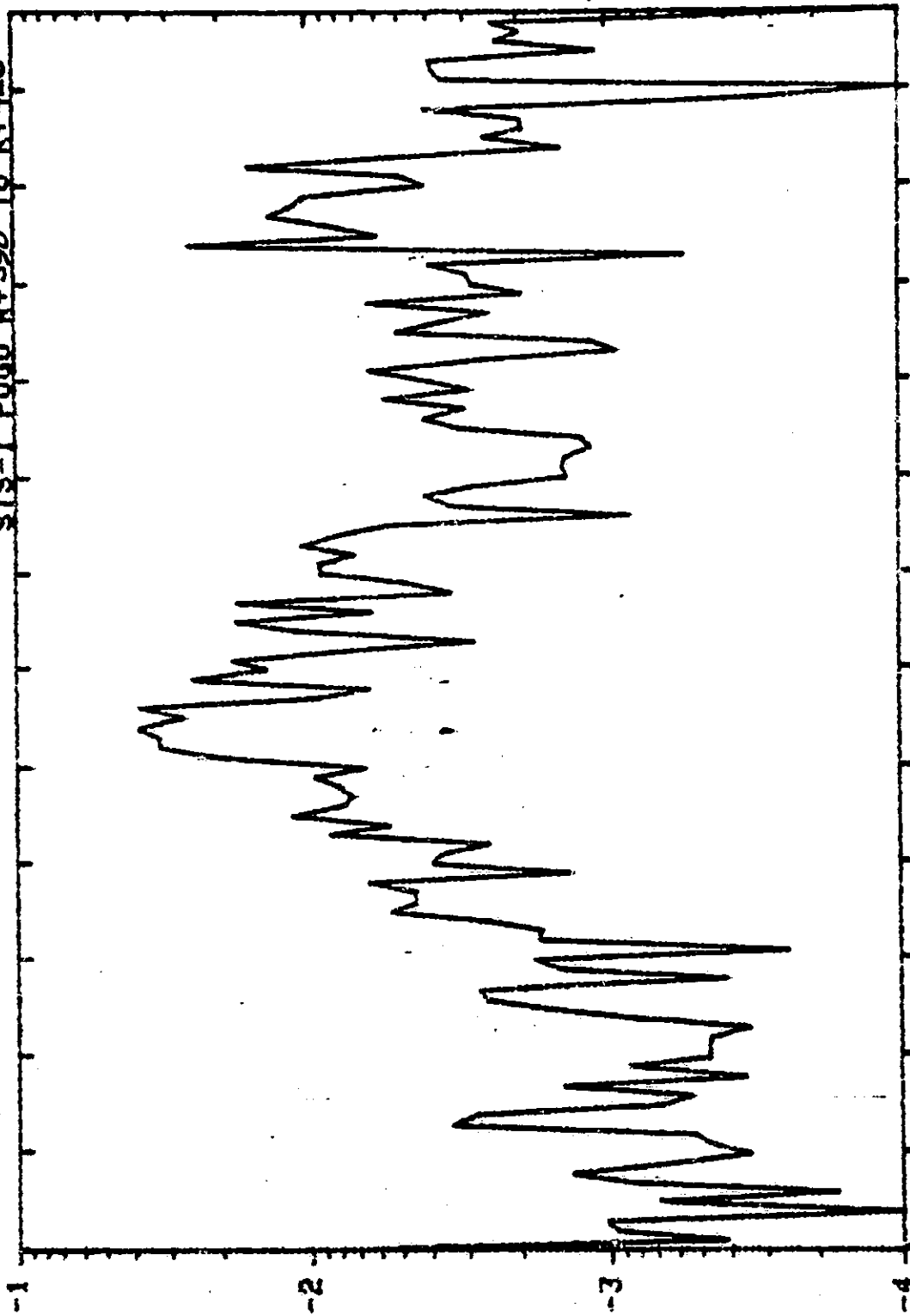
10⁻² HZ LIN

GMBL PD \ddot{x} / LPOP

Direct H(f) - Polar

ME-1 4MAY81 DC COUPLED
STS-1 POGO R+390 IQ R+426

10N



10⁻² HZ LIN

GMBL PD \ddot{x} / LPop

Direct H(f) - Polar

ME-1 4MAY81 DC COUPLED
ST9-1 POGO R+390 IQ R+426

10⁻¹

1.0

.9

.8

.7

.6

.5

.4

.3

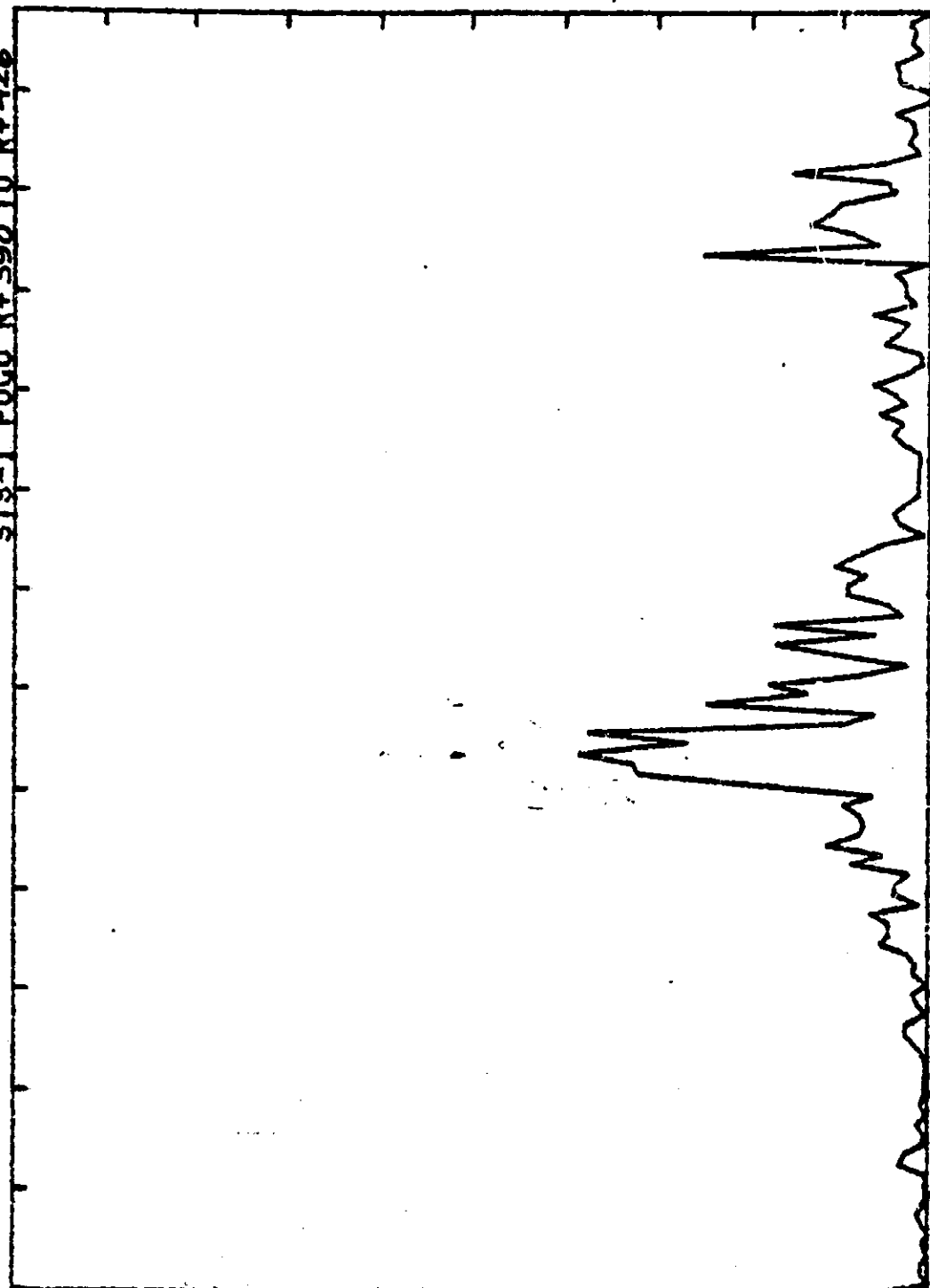
.2

.1

.0

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000

10⁻² HZ LIN

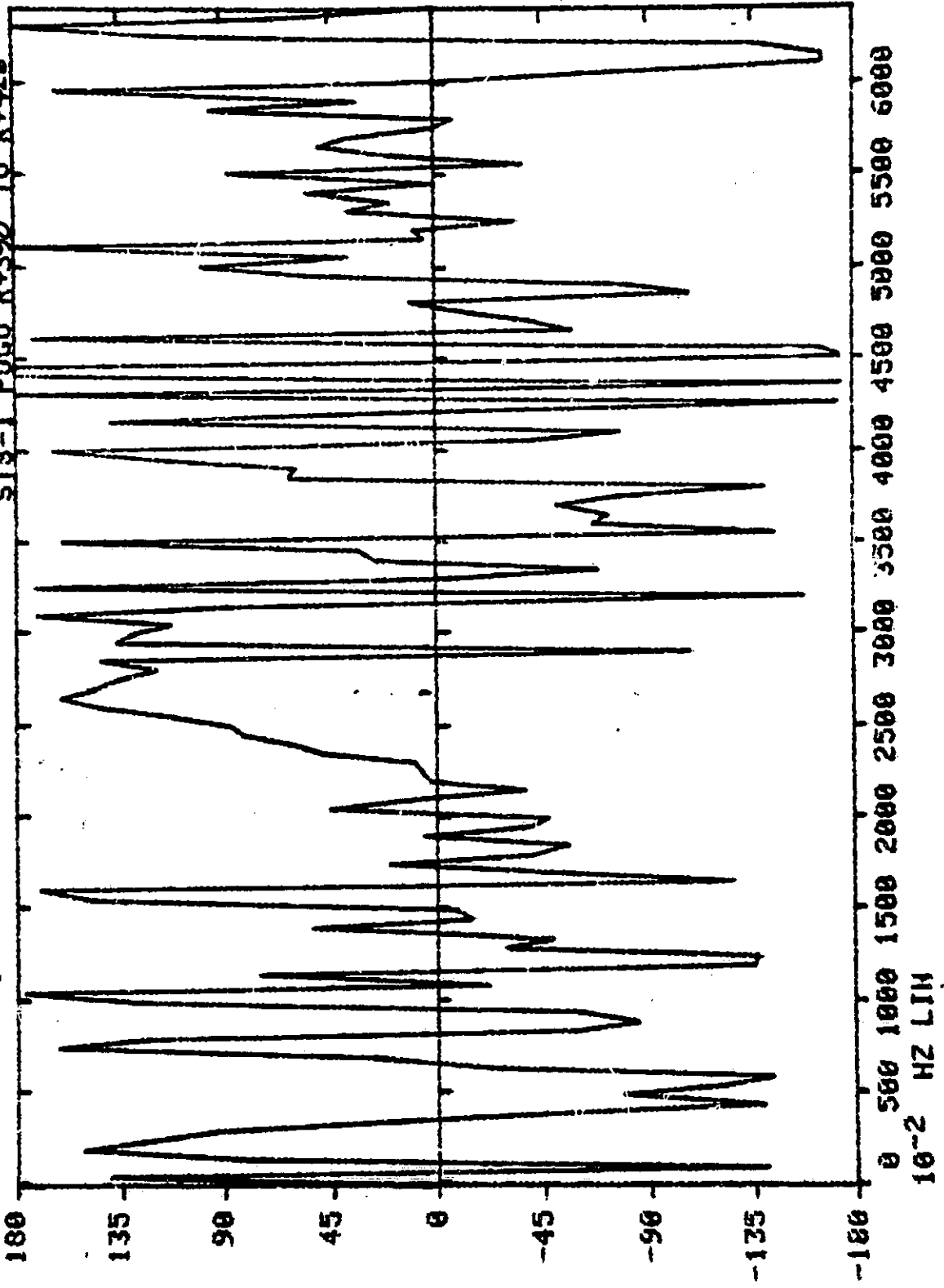


GMBL PD \ddot{x} /LPop

ME-1 4MAY81 DC COUPLED
STS-1 POGO R+390 TO R+426

Direct H(f) - Polar

DEG

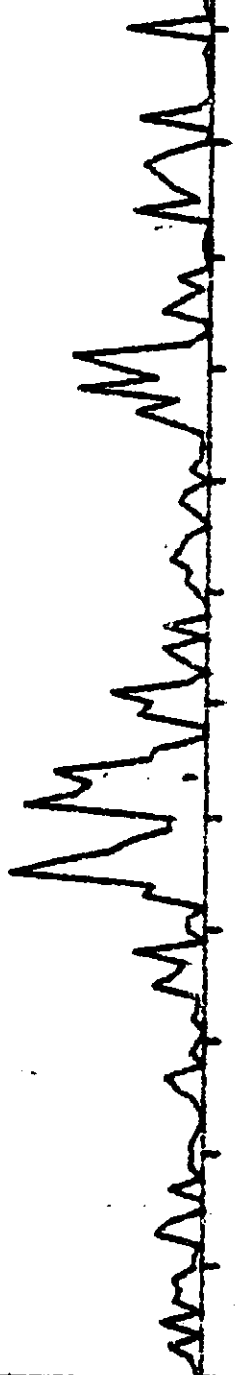


GMBL PD \ddot{x}/L_{POP}

Direct Coh(f)

ME-1 4MAY81 DC COUPLED
STS-1 F050 R+390 TO R+426

10 0
2.0
1.6
1.2
.8
.4
.0
-.4
-.8
-1.2
-1.6
-2.0

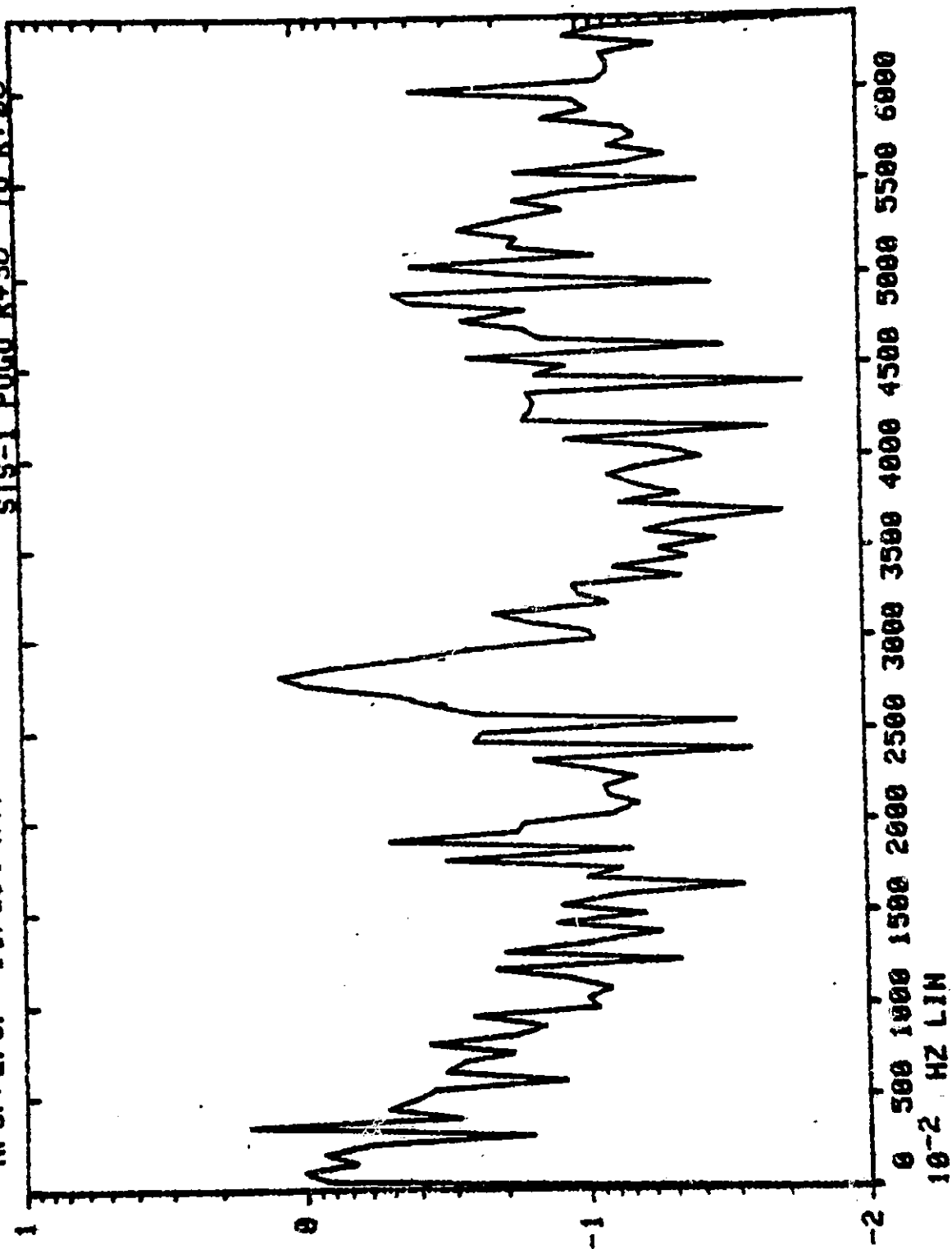


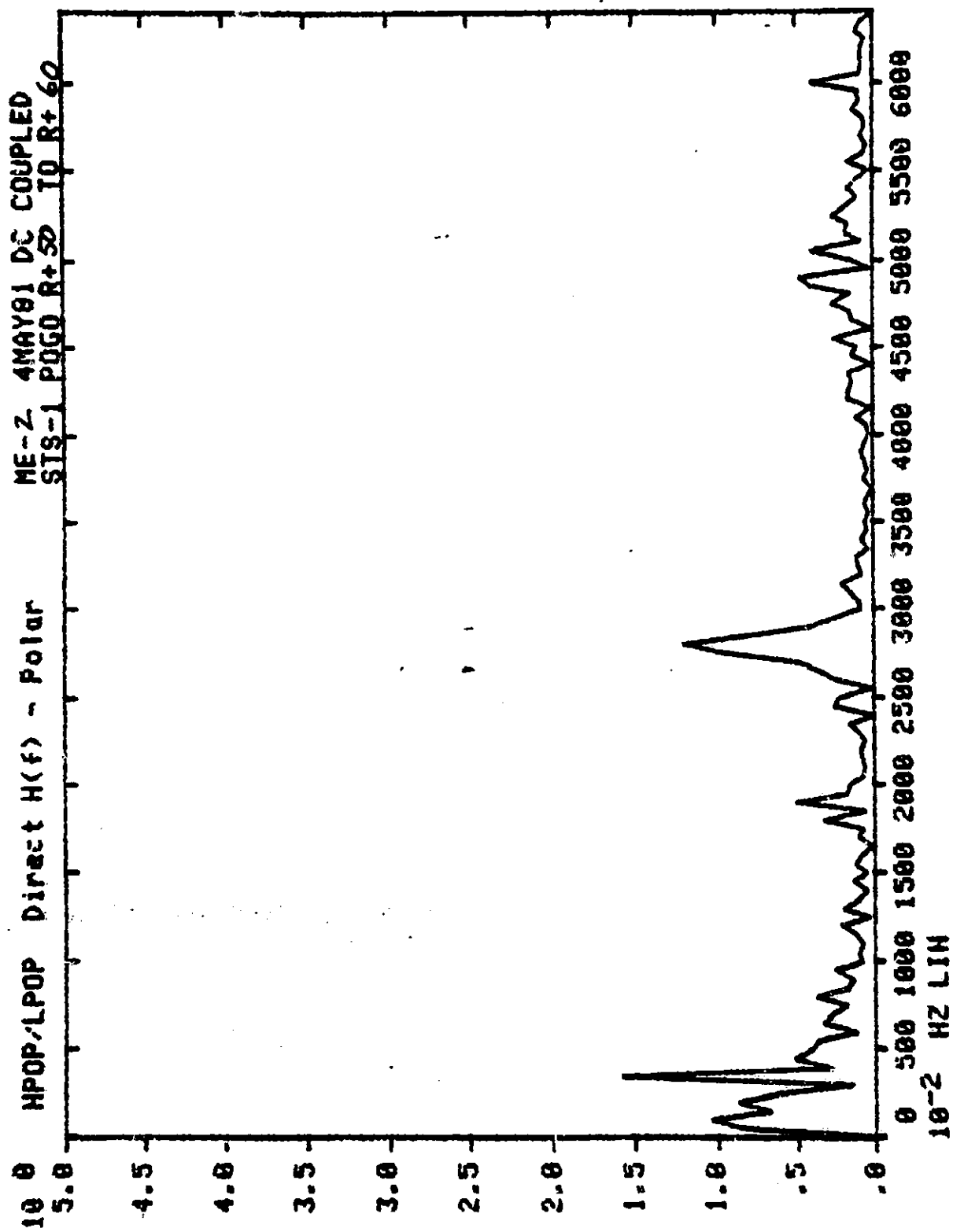
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000
10⁻² HZ LIN

ME-2- 4MAY81 DC COUPLED
STS-1 POGO R+50 TO R+60

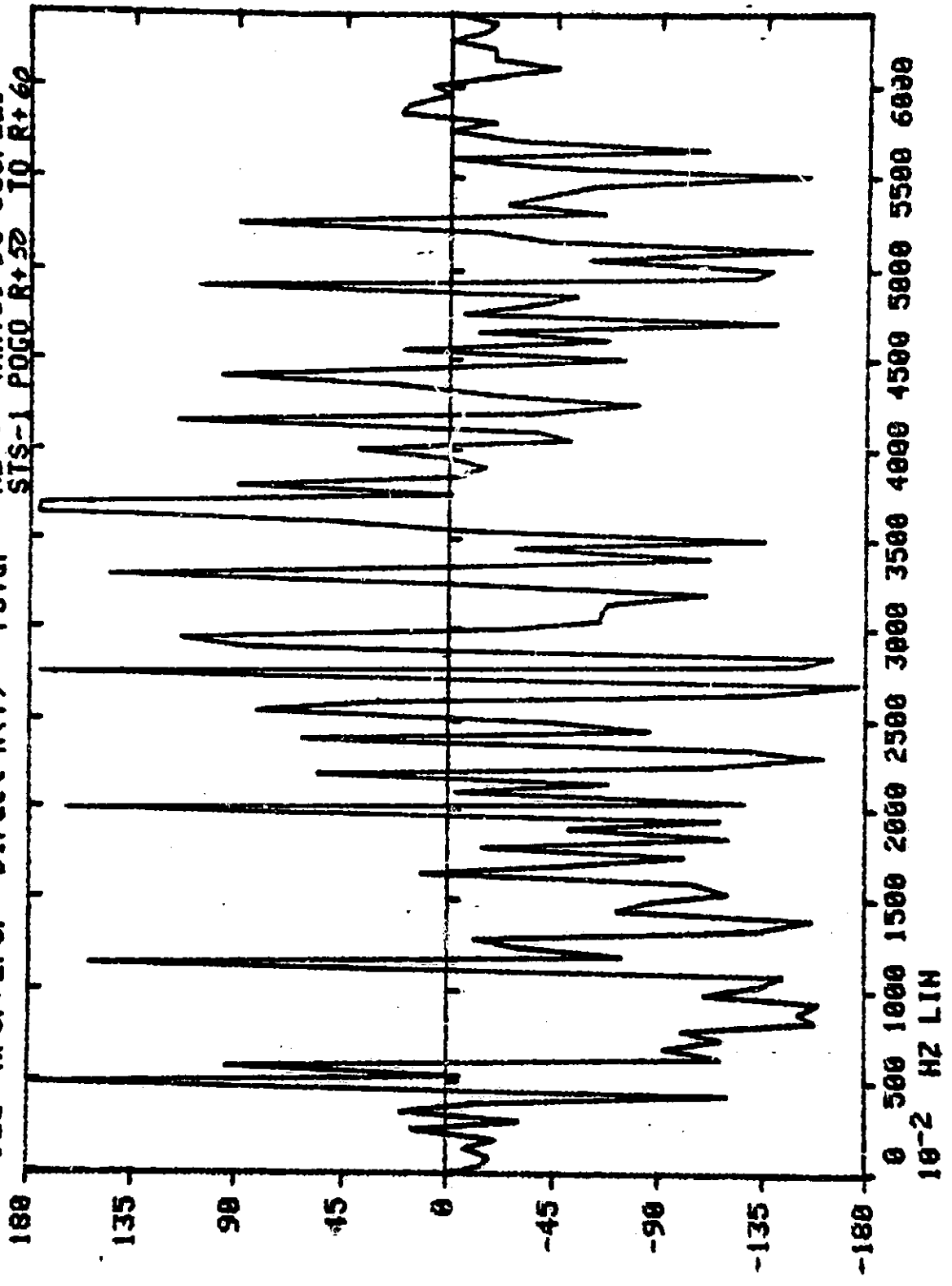
HPOP/LPOP Direct H(f) - Polar

10N





DEG HPOP/LPOP Direct H(f) - Polar ME-2 4MAY81 DC COUPLED
STS-1 POGO R+50 TO R+60

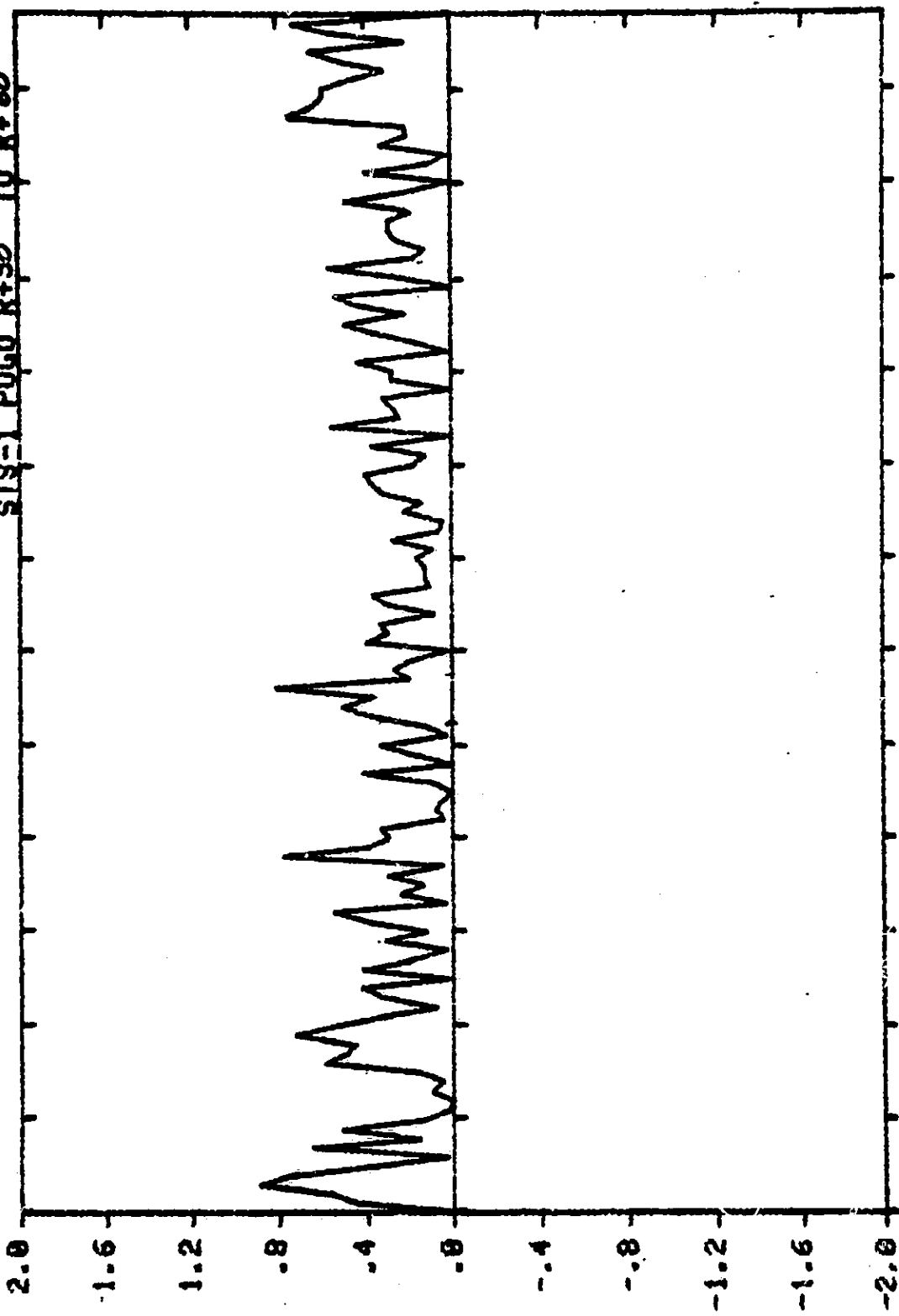


C-2

HE-2 4MAY81 DC COUPLED
STS-1 POGO R+50 TO R+60

HPOP/LPOP Direct Coh(f)

10 0



0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000
10⁻² HZ LIN

ORGANIZATION:

SYSTEMS DYNAMICS
LABORATORY

MARSHALL SPACE FLIGHT CENTER

STS-1 POGO ANALYSIS

NAME:

R. JEWELL

DATE:

MAY 1981

TRANSFER FUNCTION SHOWING 9 HZ COHERENT ENERGY

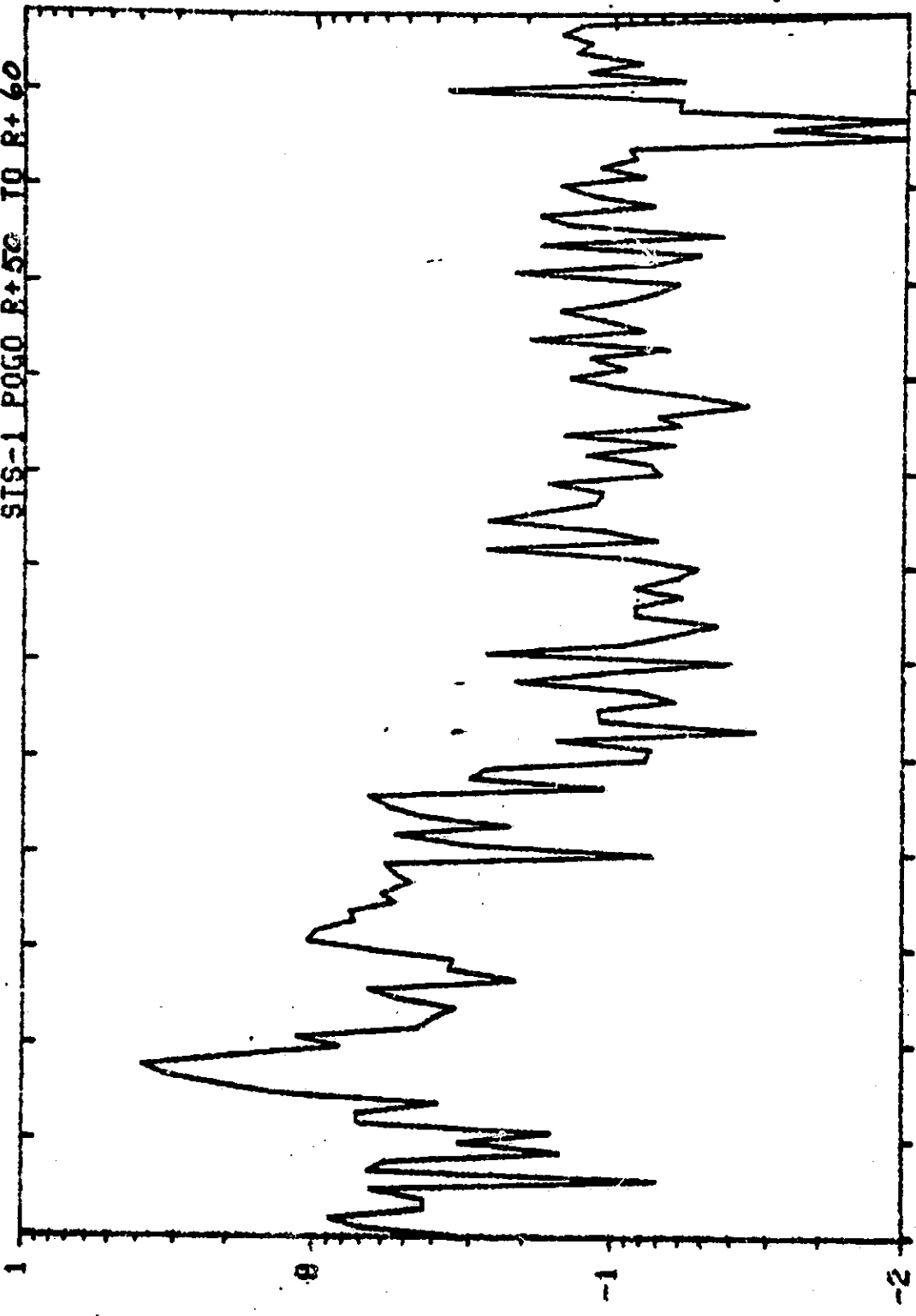
- ..
GIMBAL PAD Z/LH2 TK BT Z ..

- ..
L02 TK BT Z/LPOP

GIMBAL PAD \ddot{z} / LHZ TK BT \ddot{z}
H(f) - Polar

ME-2 4MAY61 DC COUPLED
SIS-1 POGO R+50 TO R+60

18N



0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000
10⁻² HZ LIN

GMPL PD \ddot{z} / LH2 TK BT \ddot{z}
H(f) - Polar

ME-2 4MAY81 DC COUPLED
STS-1 POGO R+50 IQ R+60

10 1
1.0

.9

.8

.7

.6

.5

.4

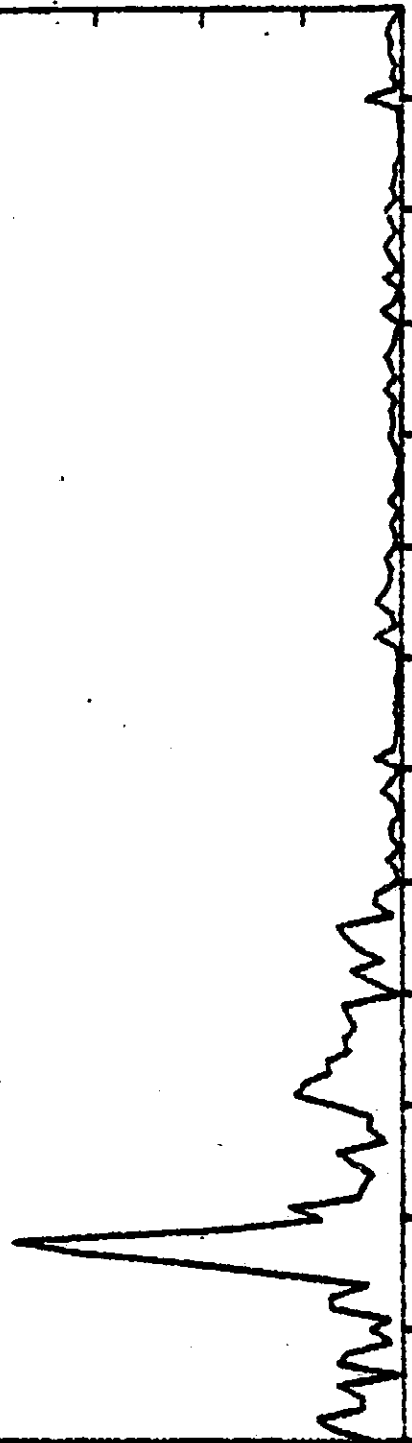
.3

.2

.1

.0

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000
10⁻² HZ LIN



GMDL PD \ddot{z} /LHZ TK BT \ddot{z}
H(f) - Polar

ME-2 4MAY81 DC COUPLED
STS-1 POGO R+50 TO R+60

DEG

180

135

90

45

0

-45

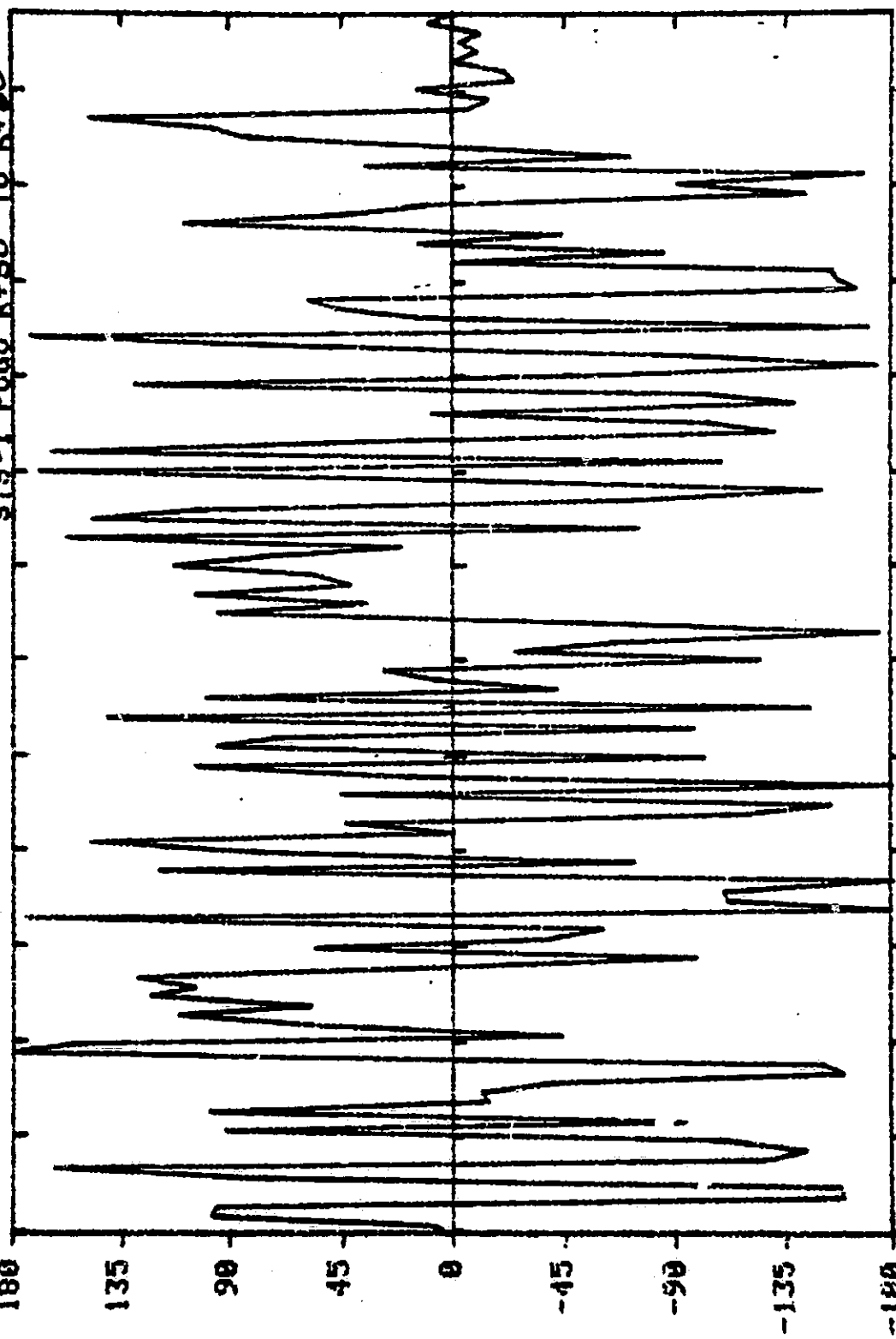
-90

-135

-180

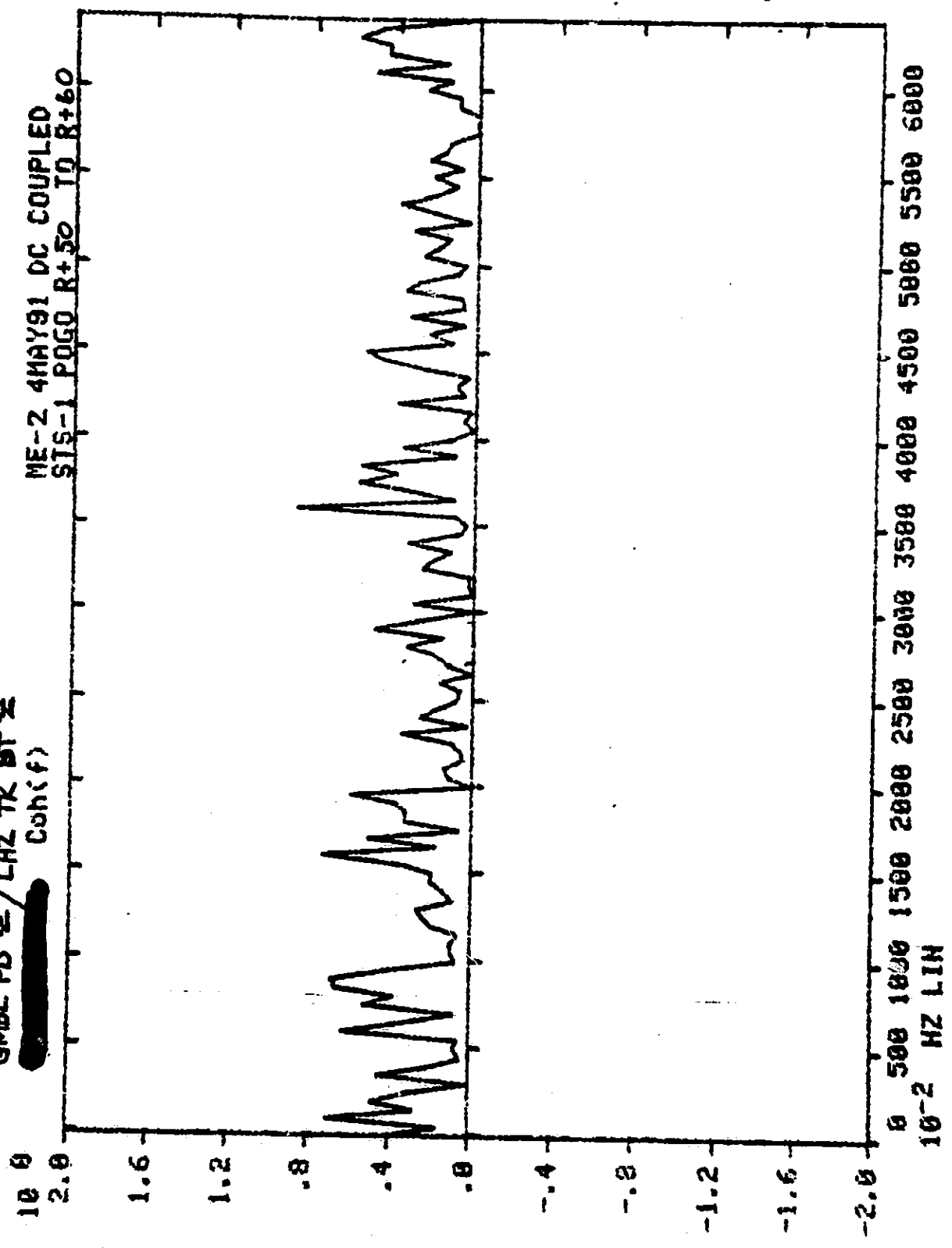
0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000

10⁻² HZ LIN



GMBL PD \ddot{z} / LH2 TK BT \ddot{z}
Coh(f)

ME-2 4MAY91 DC COUPLED
STS-1 POGO R+50 TO R+60

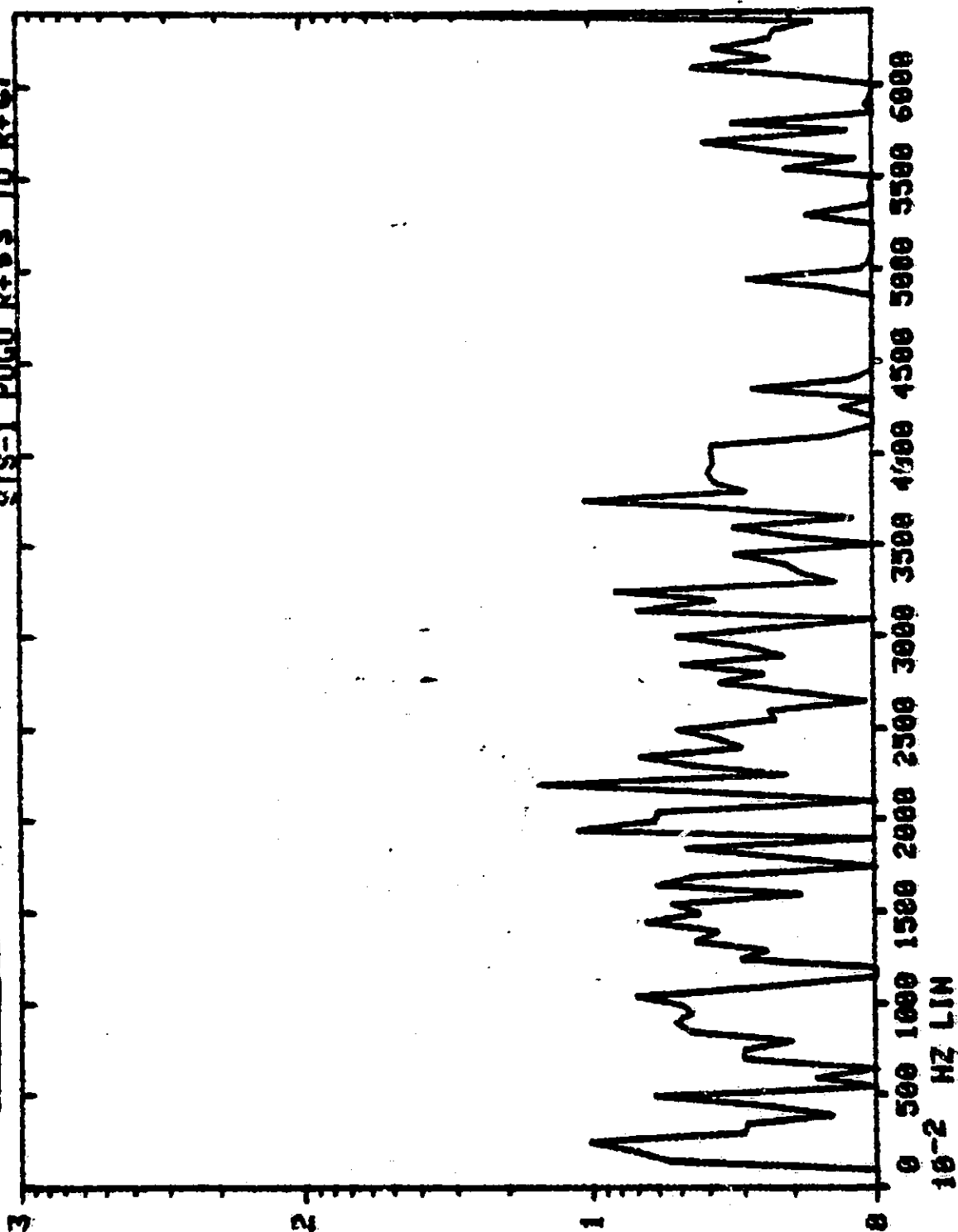


LPOP/LAS TX BT X

H(f) - Polar

ME-3 4MAY81 DC COUPLED
STS-1 POGO R+63 TO R+64

10N



$L_{POP}/L_{02} \approx 5T \times$

$H(f)$ - Polar

ME-3 4MAY81 DC COUPLED
STS-1 POGO R+53 TO R+61

10 2

2.0

1.8

1.6

1.4

1.2

1.0

.8

.6

.4

.2

.0

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000

10^{-2} HZ LIN

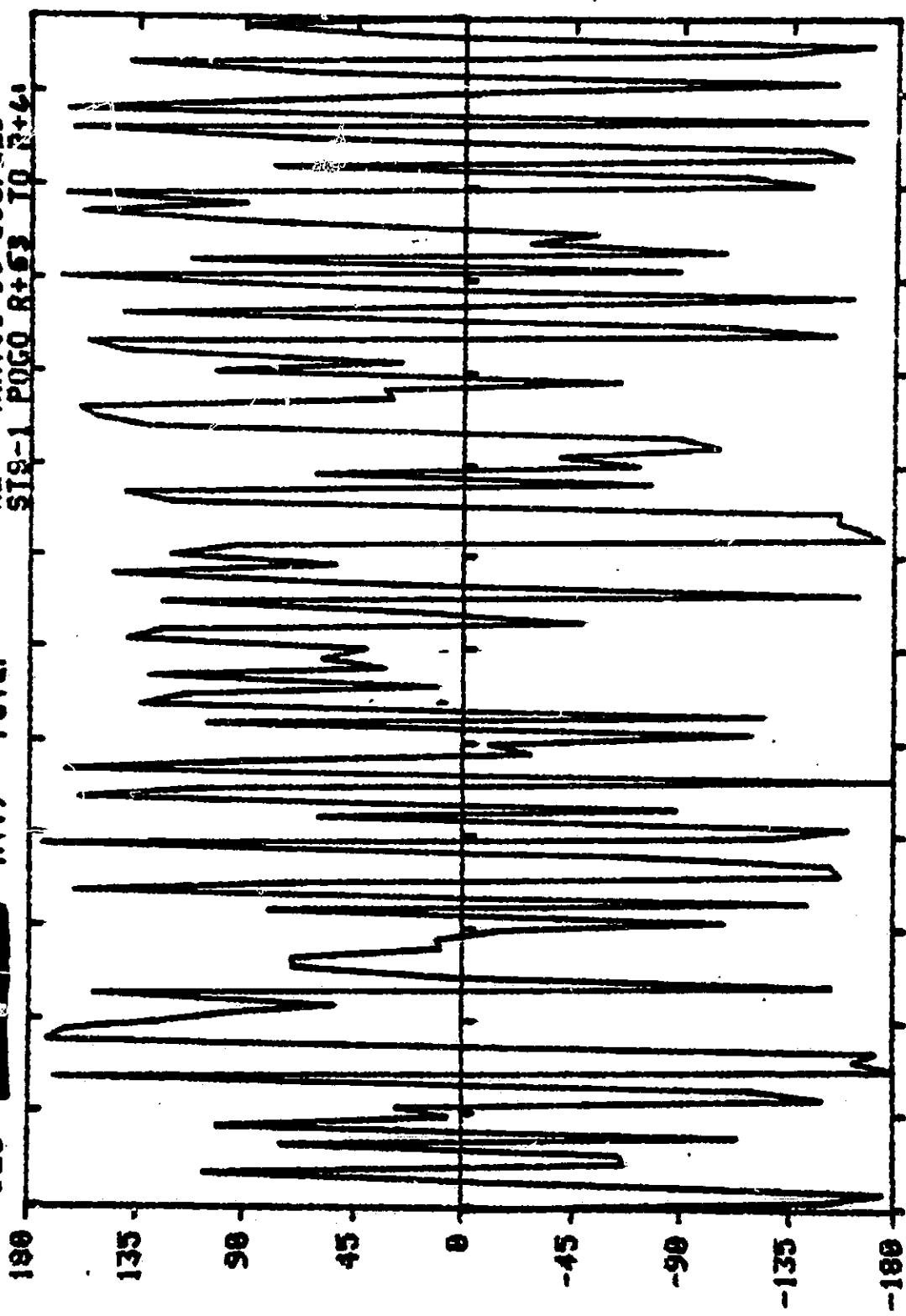


LPOP/L22 TR BT X

ME-3 4MAY81 DC COUPLED
ST9-1 POGO R+53 TO R+61

DEG H(f) - Polar

180

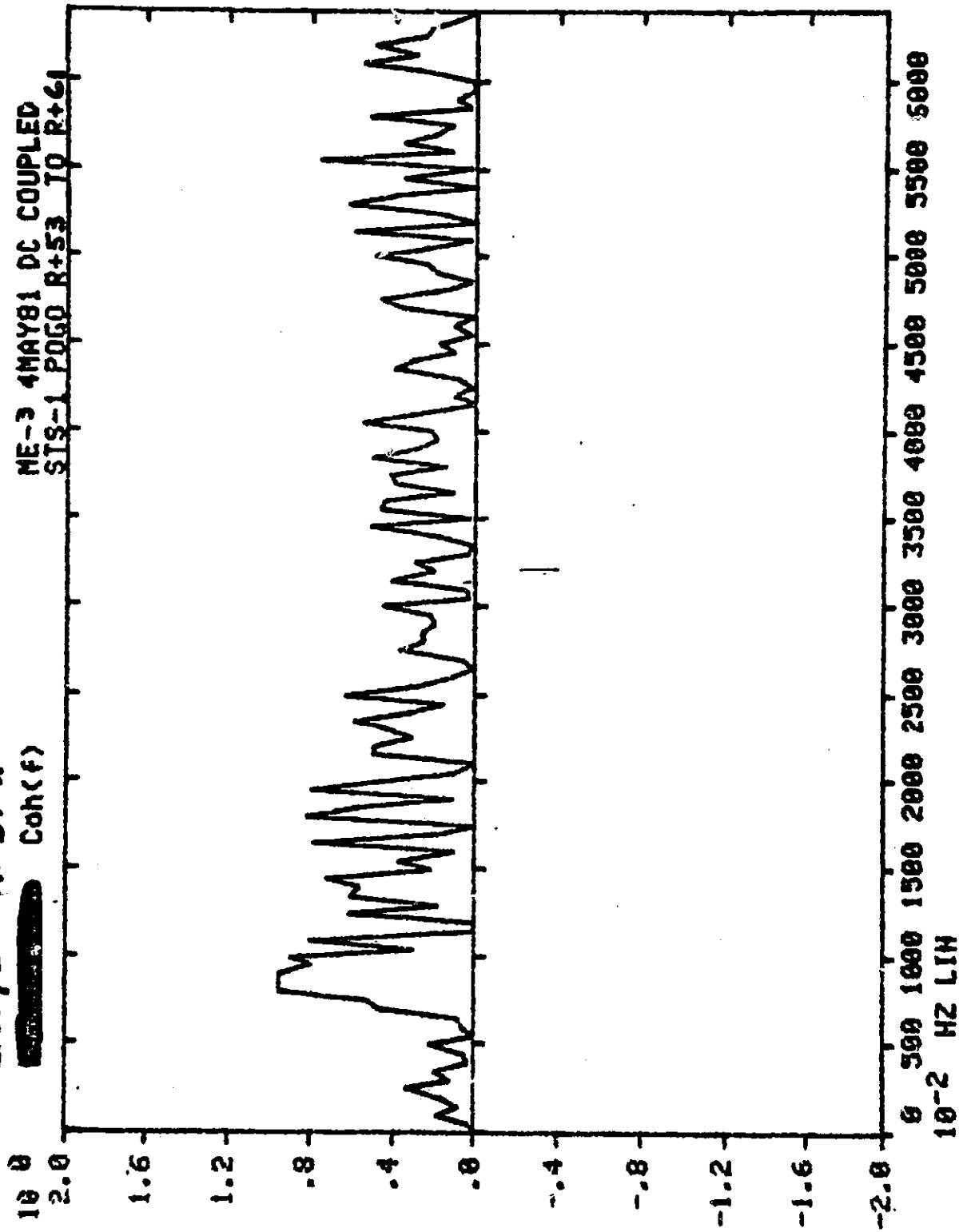


0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000

10⁻² HZ LIN

LPOF/LOZ TK BT X
Coh(f)

ME-3 4MAY81 DC COUPLED
SIS-1 P050 R+53 TO R+61

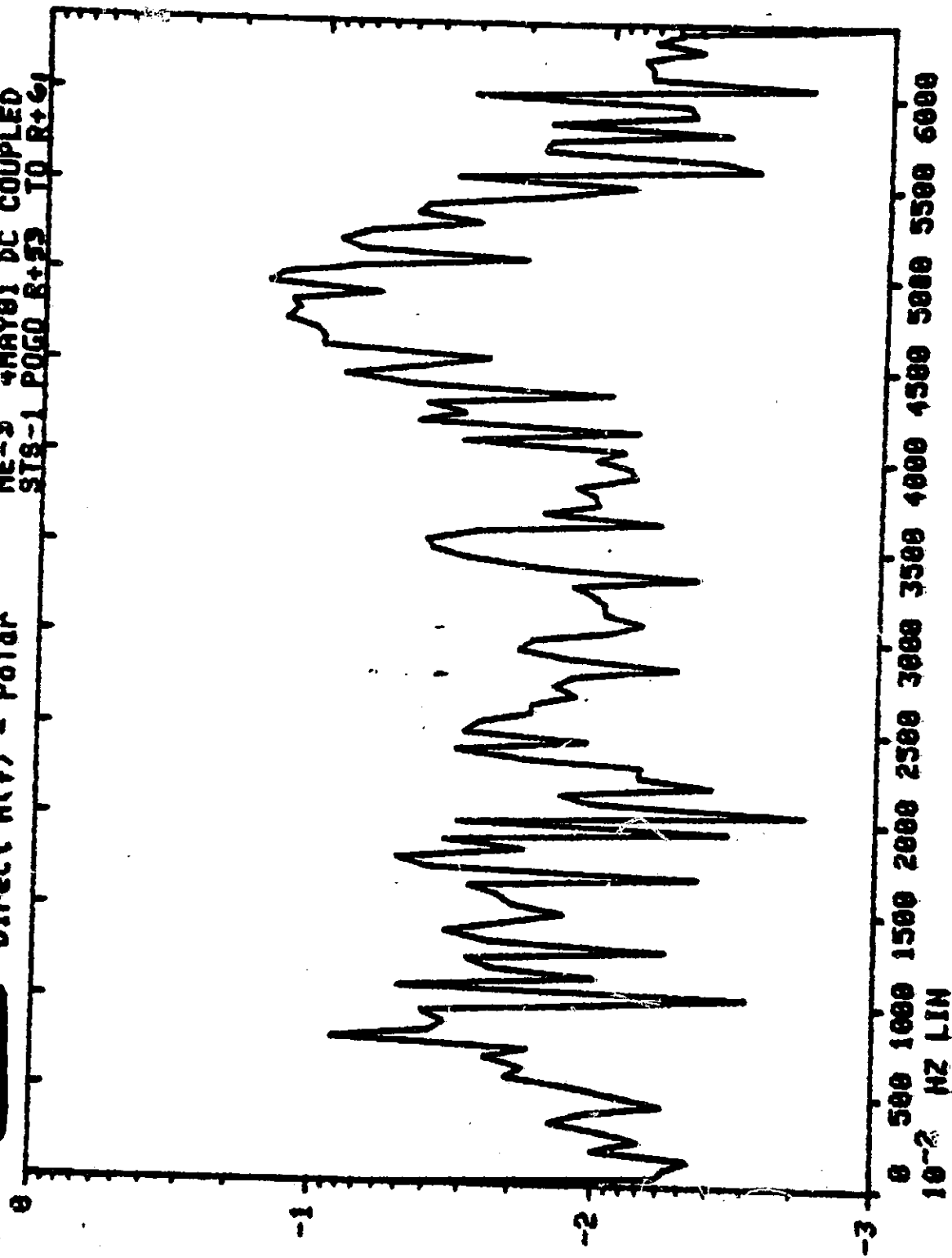


LOS TX OF $\tilde{\alpha}/LPOP$

Direct $H(f)$ - Polar

ME-3 4MAY81 DC COUPLED
STS-1 POGO R+53 TO R+61

10N



LOG TK DT $\ddot{u}/LPOP$

10⁻¹

Direct H(f) - Polar

ME-3 4MAY61 DC COUPLED

STS-1 POCO R+53 TO R+64

5.0

4.5

4.0

3.5

3.0

2.5

2.0

1.5

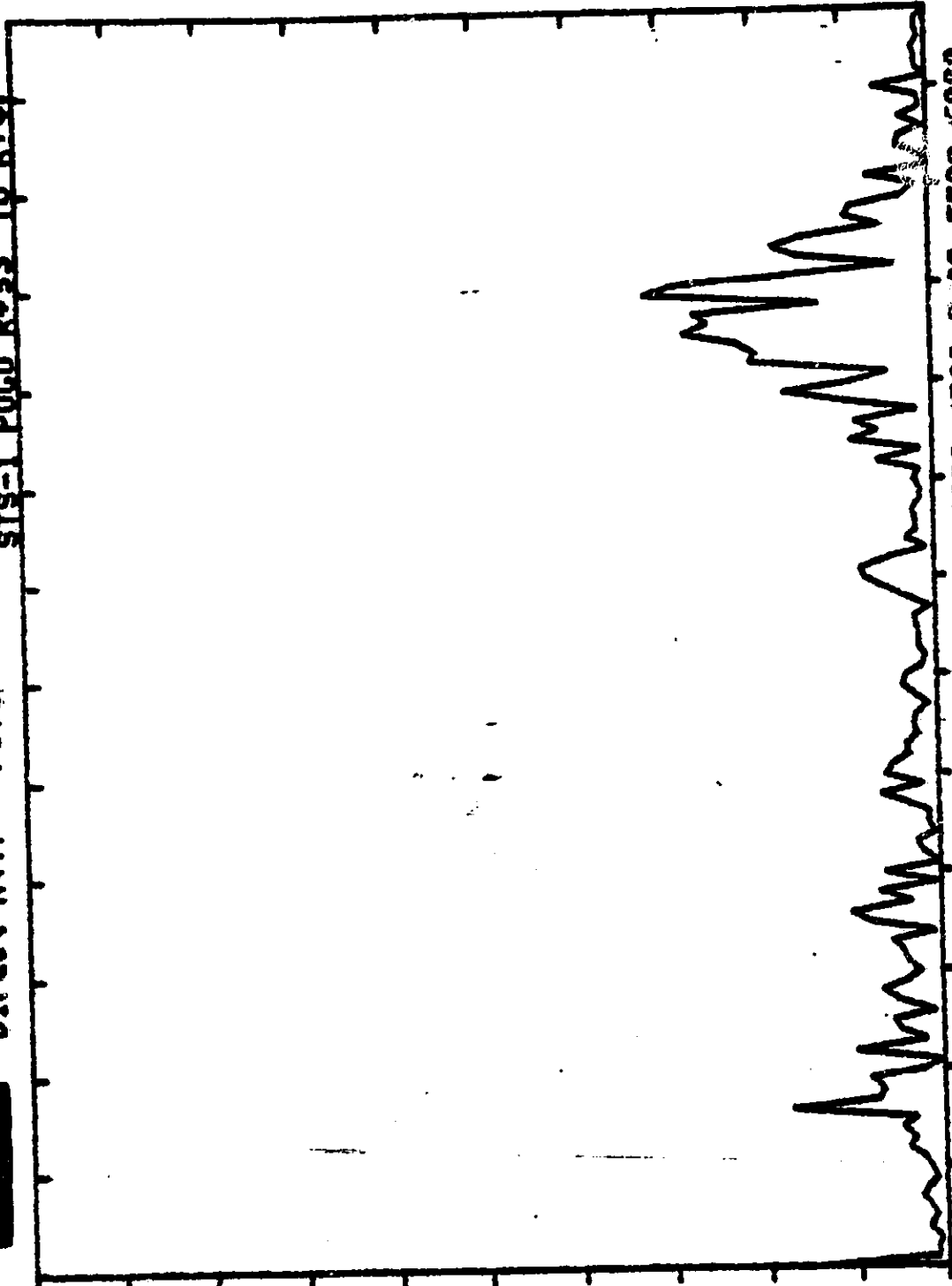
1.0

.5

.0

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000

10⁻² HZ LIN



LOG TM OF $\ddot{e}/LPOP$

ME-3 4MAY81 DC COUPLED
STS-1 P050 R+53 TO R+61

Direct H(f) - Polar

DEG

180

135

90

45

0

-45

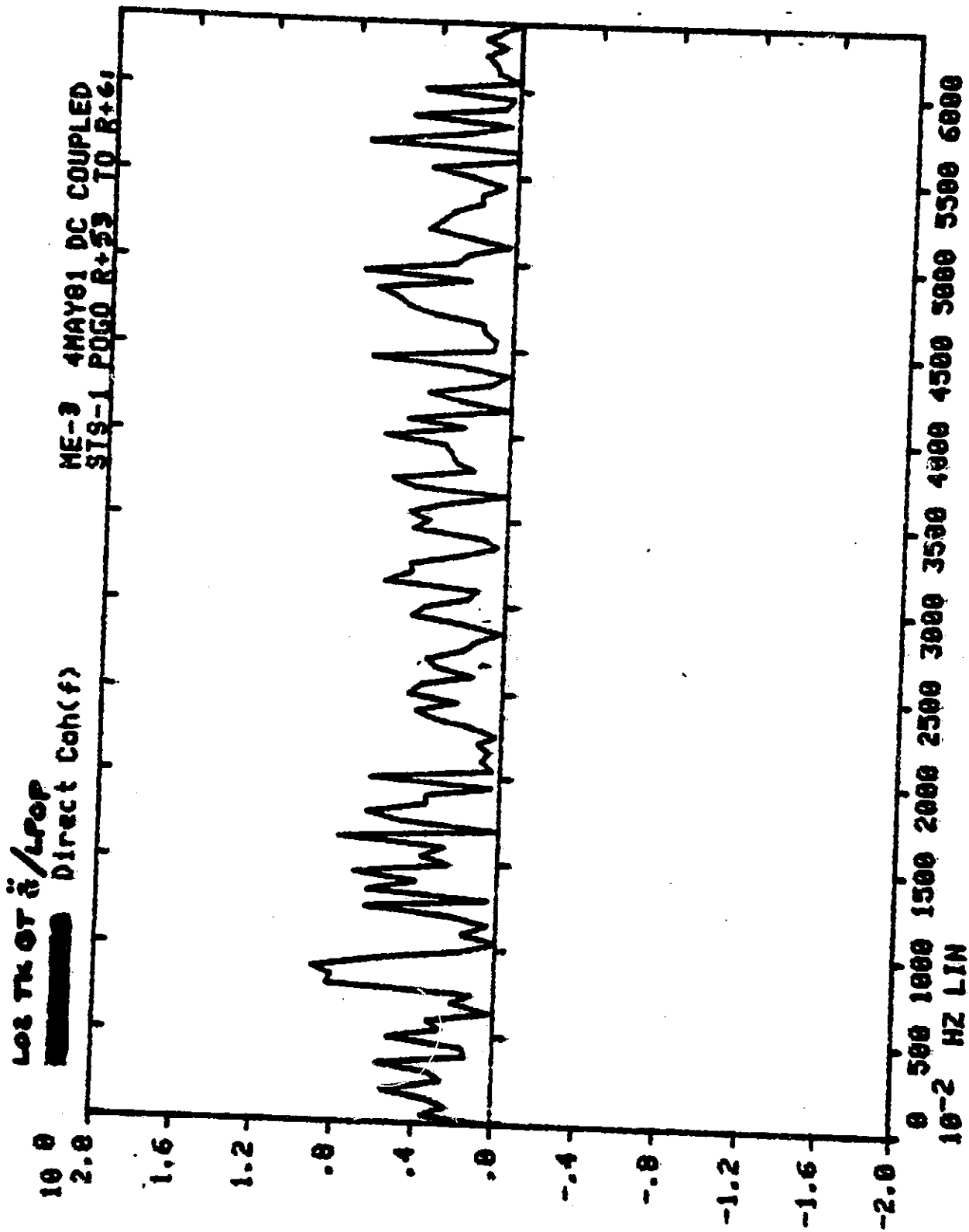
-90

-135

-180

0 500 1000 1500 2000 2500 3000 3500 4000 4500 5000 5500 6000

10^{-2} HZ LIN

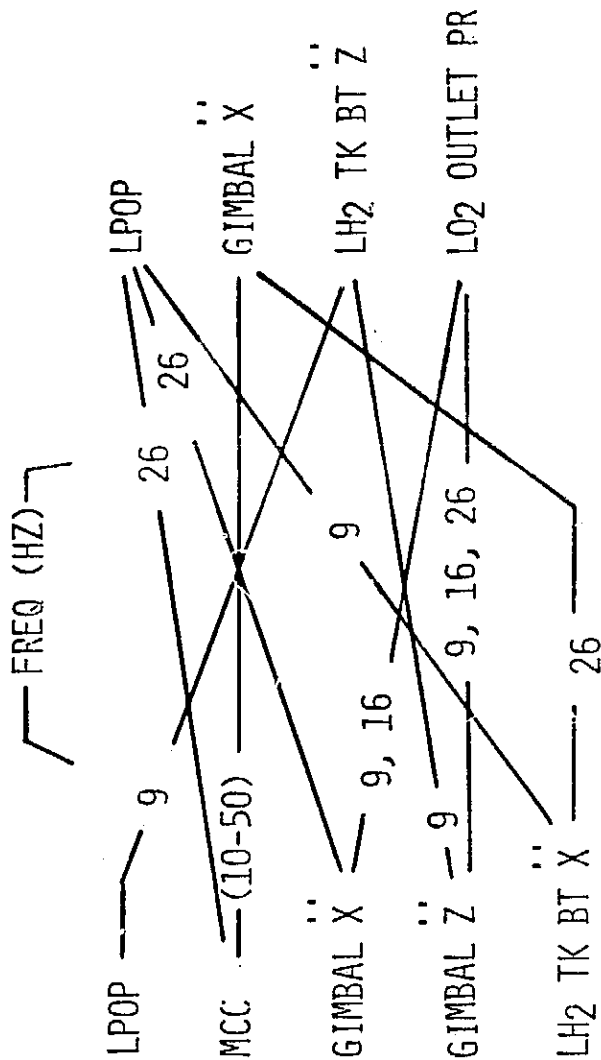


ORGANIZATION: SYSTEMS DYNAMICS LABORATORY	MARSHALL SPACE FLIGHT CENTER STS-1 POGO ANALYSIS	NAME: R. JEWELL DATE: MAY 1981
<p style="text-align: center;"><u>OBSERVATIONS</u></p> <p>0 STS-1 DATA QUALITY, IN GENERAL, IS GOOD; HOWEVER, SOME QUESTIONS OF DATA VALIDITY DO REMAIN</p> <ul style="list-style-type: none"> - ME-1 LPOP PRESSURE APPEARS TO BE HIGH (~10 dB); NOT CONSISTENT WITH OTHER STS-1, FRF, AND SINGLE ENGINE DATA. - ME-2 ACCUMULATOR PRESSURE APPEARS TO BE HIGH (8-10 dB); ALSO NOT CONSISTENT WITH STS-1, FRF, AND SINGLE ENGINE DATA. - ME-3 HPOP PRESSURE LEVELS IN THE 1-10 HZ RANGE ARE MUCH LOWER THAN NORMAL. <p>0 LPOP, ACCUMULATOR, HPOP, AND MCC PRESSURE LEVELS AND FREQUENCY CHARACTERISTICS ARE CONSISTENT WITH FRF AND SINGLE ENGINE DATA (750-80 AND 81).</p> <p>0 MOST COMMONLY OBSERVED FREQUENCIES/MODES WITH A HIGH DEGREE OF COHERENCE ARE 9/10, 16/17, AND 25/26 HZ.</p>		

ORGANIZATION: SYSTEMS DYNAMICS LABORATORY	MARSHALL SPACE FLIGHT CENTER STS-1 POGO ANALYSIS	NAME: R. JEWELL
		DATE: MAY 1981

OBSERVATIONS (CONT'D)

0 ENERGY TRANSFER PATHS AT 9/10, 16/17, AND 25/26 HZ



ORGANIZATION: SYSTEMS DYNAMICS LABORATORY	MARSHALL SPACE FLIGHT CENTER STS-1 POGO ANALYSIS	NAME: R. JEWELL DATE: MAY 1981
<p data-bbox="406 919 454 1134"><u>CONCLUSIONS</u></p> <p data-bbox="550 459 662 1624">0 MCC PRESSURE IS STATIONARY THROUGHOUT 100% POWER LEVEL SSME BURN AND IS EQUAL TO FRF AND SINGLE ENGINE LEVELS.</p> <p data-bbox="758 470 869 1624">0 LOW AMPLITUDE PRESSURE OSCILLATIONS WERE EVIDENT DURING SSME BURN.</p> <p data-bbox="957 470 1013 1624">0 LOW AMPLITUDE 26 HZ ENERGY IS PRESENT IN LPOP AND MCC.</p>		